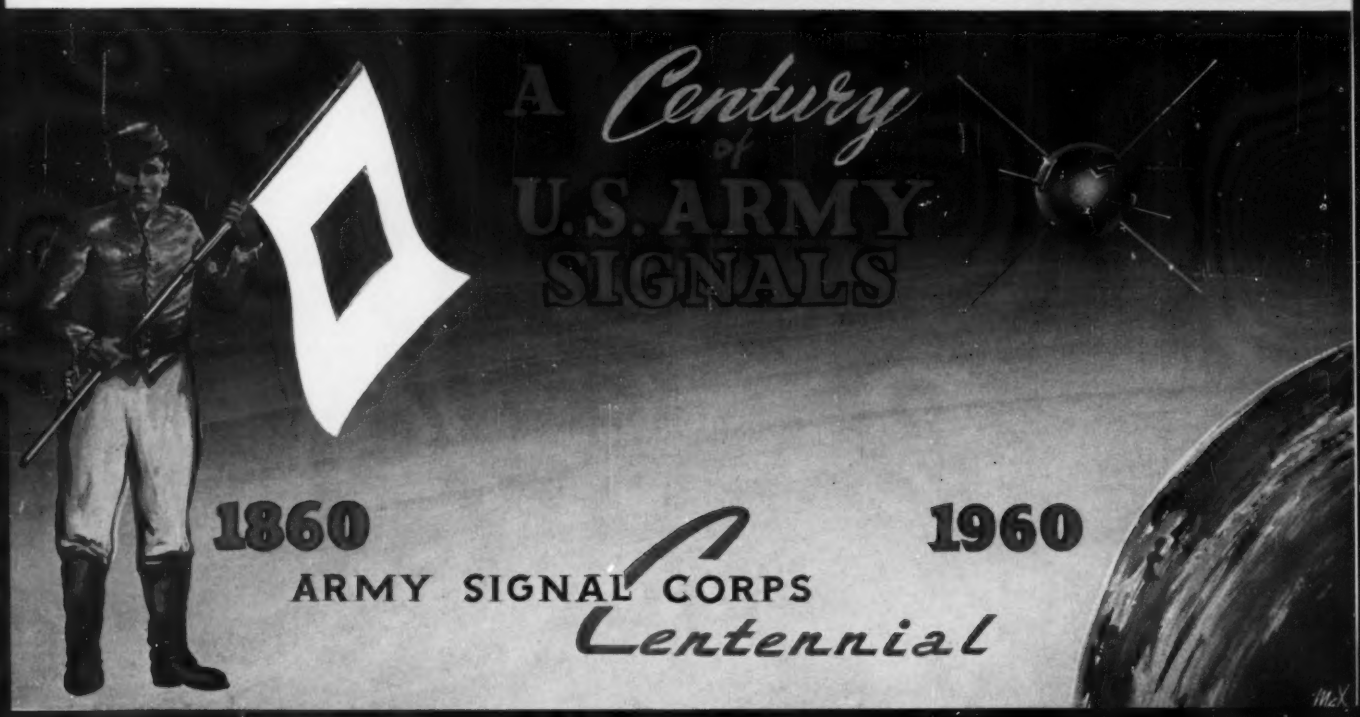
JUNE 18, 1960
VOL. 158 — NO. 25

Telephony

U. S. Army Signal Corps soldiers, dressed in war-time uniforms from the Civil War on, covering 100 years of U. S. Army Signal Corps progress, view a model of the April-launched first weather Satellite, TIROS I, developed by the Army Signal Corps. The Indian represents the earlier American modes of communication — smoke signals and "lance talk" —which were, in part, modified and adopted by Brig. Gen. Albert J. Myer, first Chief Signal Officer.

Published every week on Saturday by TELEPHONY PUBLISHING CORP., 608 S. Dearborn St., Chicago 5, Ill. Subscription $4.50 per year. Entered as second class matter at the Post Office at Chicago, Ill. under the act of Mar. 3, 1879.



how much

MORE revenue per dollar of investment with the Petite phone

?

a whale of a lot! The exact amount depends on your particular operation. But one thing's sure: you earn a lot more revenue sooner with Stromberg-Carlson's PETITE telephone than with any other type of extension . . . and more revenue per dollar of investment.

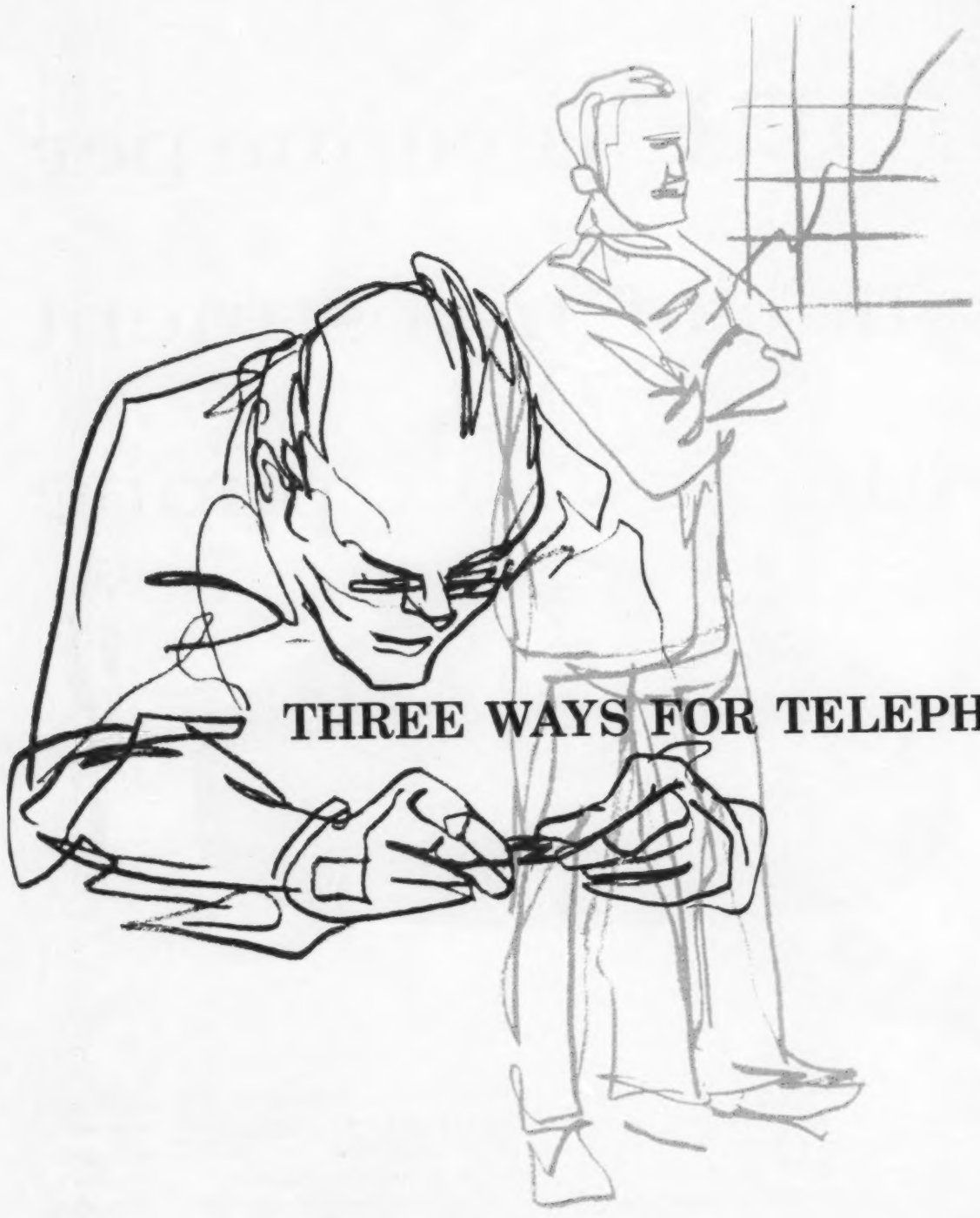
Sounds exciting, doesn't it? We can give you "chapter and verse" on just how exciting it is!

The amazing revenue performance of the PETITE is all worked out for you. We have the proof in black and white. The figures demonstrate conclusively why hundreds of independent operating companies* have already ordered this wonderful little profit-booster—available for delivery from stock July 15.

Want to know the whole story? Drop us a line or shoot us a wire. Or phone your nearest Stromberg-Carlson representative. In Atlanta call TRinity 5-7467; Chicago: STate 2-4235; Kansas City: HArrison 1-6618; Rochester: HUbbard 2-2200; San Francisco: OXford 7-3630.

Names on request

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**



THREE WAYS FOR TELEPHONE

LEICH GENERAL SYSTEM

Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

COMPANIES TO INCREASE PROFITS

There are three ways for your company to increase its profits.
You can raise rates, you can sell more service to more people . . .
or you can decrease the cost of furnishing service.

The telephone equipment you select is one of the most important
factors in decreasing costs. Consider then, Leich's attitude.

Leich has but one source of income. That's the
Independent telephone industry which we've served for over fifty years.
When we design a piece of telephone apparatus, we design it
so it will work well and long. We design it to eliminate
much of the costly maintenance that can cut into your profits.

In building Leich telephone equipment, we use the best materials.
And we build pridefully and carefully, so our basic,
money-saving design is not lost because of faulty craftsmanship.

Whether you're buying telephones, PBX's, PABX's, dial switching
equipment, line concentrators, or whatever, it will pay you to
get the story on Leich equipment.

LEICH SALES CORPORATION • 427 WEST RANDOLPH STREET • CHICAGO 6, ILLINOIS
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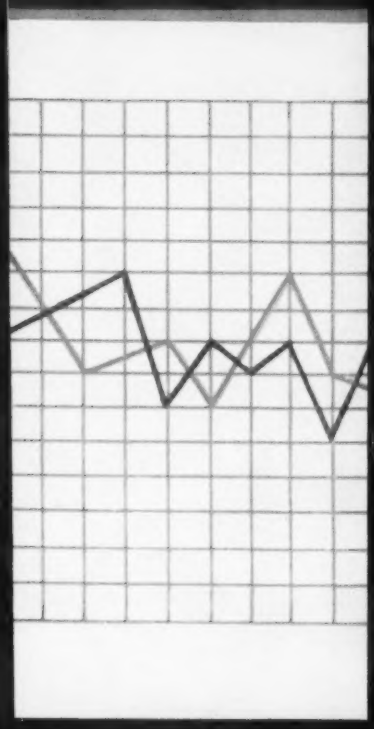


Are you operating your company as a HOBBY OR A BUSINESS?

No business can endure without profit.

The key to profit is, of course, **increased** revenue! For the operating telephone company extension installations offer the prime opportunity to realize revenue increases!

The Ericofon is the biggest boost you can give yourself in your extension promotions! Subscribers want Ericofons—this has been proven over and over! **No other telephone** has the built-in appeal of the Ericofon, the built-in convenience of the Ericofon, the built-in beauty of the Ericofon, the built-in profit potential of the Ericofon.

North will help you in your extension promotions—North's Ericofon merchandising aid has already established a whole new pattern for the entire industry! The combination of Ericofons and Ericofon merchandising materials and plans—**available to you at no cost**—has worked successfully for countless companies already!

Are you losing revenue that could be yours? If you're not offering your subscribers Ericofons—you **are** losing revenue every day!

NOT SURE YET? YOU CAN GET PROOF FROM . . .

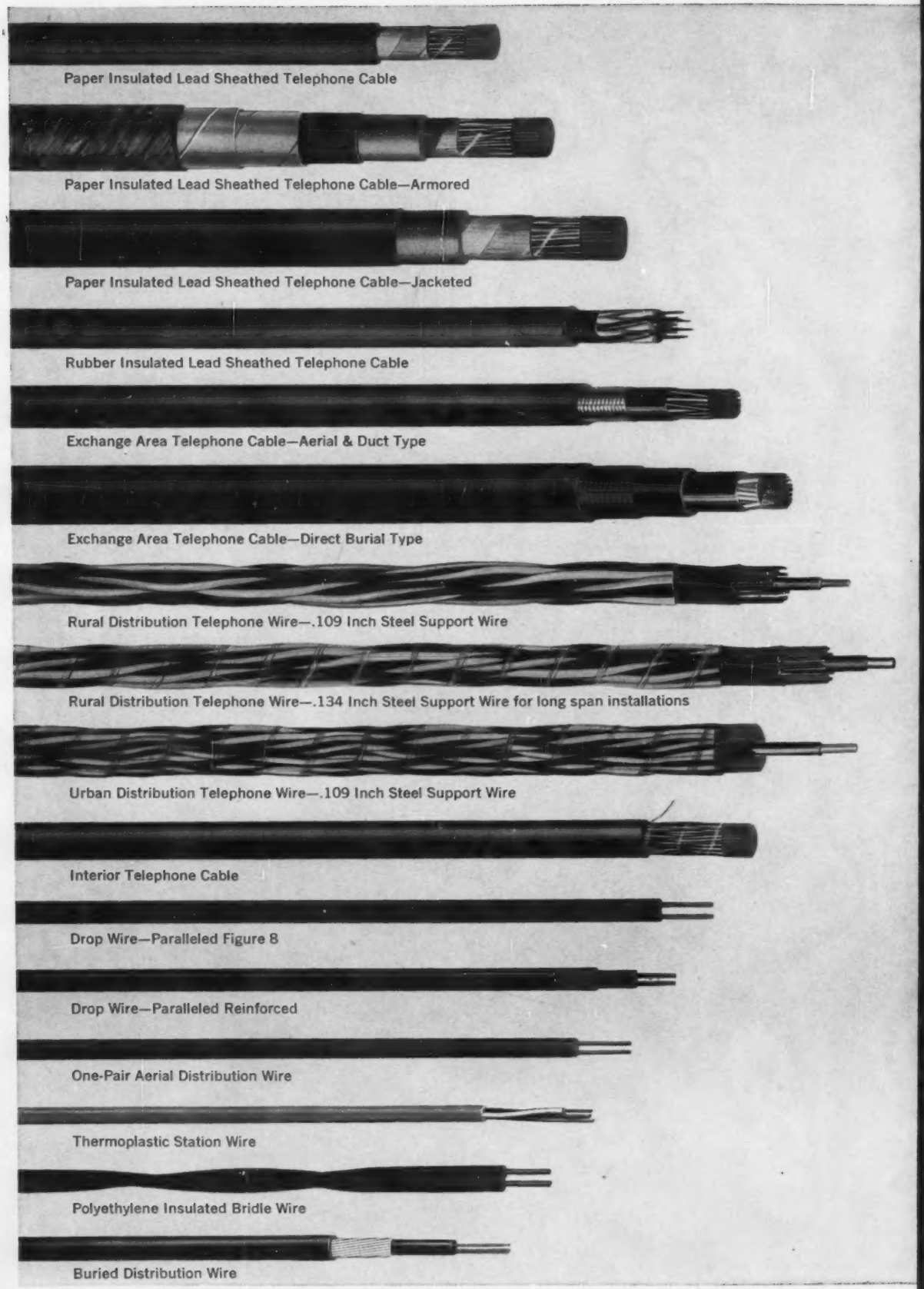
THE DYNAMIC FORCE IN THE TELEPHONE INDUSTRY

NORTH ELECTRIC COMPANY

Galion, Ohio

NORTH

60-T-3



Paper Insulated Lead Sheathed Telephone Cable

Paper Insulated Lead Sheathed Telephone Cable—Armored

Paper Insulated Lead Sheathed Telephone Cable—Jacketed

Rubber Insulated Lead Sheathed Telephone Cable

Exchange Area Telephone Cable—Aerial & Duct Type

Exchange Area Telephone Cable—Direct Burial Type

Rural Distribution Telephone Wire—.109 Inch Steel Support Wire

Rural Distribution Telephone Wire—.134 Inch Steel Support Wire for long span installations

Urban Distribution Telephone Wire—.109 Inch Steel Support Wire

Interior Telephone Cable

Drop Wire—Paralleled Figure 8

Drop Wire—Paralleled Reinforced

One-Pair Aerial Distribution Wire

Thermoplastic Station Wire

Polyethylene Insulated Bridle Wire

Buried Distribution Wire

FOR PRODUCT DEPENDABILITY... SPECIFY

PHELPS DODGE

TELEPHONE WIRE & CABLE

... the "mine-to-market" quality line!

Behind the rugged dependability and high quality of Phelps Dodge telephone wire and cable are years of experience and research in the design and manufacture of communication cables.

Phelps Dodge pioneered the use of lead, paper, rubber and thermoplastics as applied to wire and cable. This valuable background of knowledge is combined by Phelps Dodge with highest grade materials and controlled craftsmanship in fabrication. The result is a complete line of reliable telephone wire and cable that helps reduce maintenance costs and provide longer in-life service.

Phelps Dodge will be glad to help you fill your wire and cable requirements. Get in touch with your nearest Phelps Dodge sales office.

PHELPS DODGE COPPER PRODUCTS CORPORATION

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SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N. C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

WHAT CAN YOU TELL A TEEN-AGE GIRL ABOUT THE TELEPHONE?

Today's teen-age girls are probably the telephone's most enthusiastic boosters.

You might think it would be unnecessary to advertise the telephone's value to them.

But we think differently. There are many ways the telephone can be even more helpful in a teen-ager's life. For instance—making thoughtful use of public phones.

Many of the ads we run during the year in *American Girl, the Scholastic Magazines, Scholastic Roto* and *Seventeen* point out worthwhile reasons for using public phones.

Other ads suggest still other constructive uses for the phones at home—uses that help a girl get things done and keep up with what's going on in her world.

Above all, this advertising emphasizes to girls the value of good, dependable telephone service at their fingertips, at home and away.

And something else to bear in mind. Today's teen-ager will be tomorrow's homemaker.

"The gang's stopping by for a soda!"

BELL TELEPHONE SYSTEM

"Mother... need anything downtown?"

"Hi, Mom! I called so you wouldn't worry!"

FLASHES AND PLUGS

BIRTH DATE OF SIGNAL CORPS. Appointment of a signal officer for the Army was authorized by Congress on June 21, 1860.

•

FIRST ARMY ARCTIC EXPLORATION. Participating in a joint international effort to obtain meteorological data in Arctic areas, the Army Signal Corps, between 1881 to 1884, dispatched one expedition to Point Barrow under command of Lt. Phillip H. Ray and another to Grinnell Sound under command of Lt. Adolphus W. Greely. This was the first official peacetime enterprise in which the United States participated internationally.

•

FIRST WIRE-WIRELESS COMMUNICATION. Over a single twisted-pair wire telephone circuit between the Signal Corps Laboratory at the National Bureau of Standards and a small laboratory on Pennsylvania Avenue in Washington, two separate telephone conversations were carried simultaneously on Sept. 18, 1910.

•

FIRST AMERICAN RADAR. On May 18, 1937, an experimental model of the first Army radar set, designed and developed by the Signal Corps, was successfully demonstrated at Fort Monmouth. It was used to detect and locate aircraft and to direct searchlight beams for antiaircraft batteries. It was the progenitor of many radar sets developed by the Army Signal Corps.

•

SOLAR CELLS ENERGIZE SATELLITES. Vanguard I, on Mar. 17, 1958, was launched and placed in orbit using Army-developed solar converters to provide power for one of its two radio transmitters. Engineers of U. S. Army Signal Research and Development Laboratory, Fort Monmouth, developed a solar converter which used commercially available solar cells to provide electrical power for the satellite's radio.

•

METEOROLOGICAL ROCKET. Successful test firings of a new low-cost meteorological rocket (ARCAS) that can be fired by a two-man crew were made by the U. S. Army Signal Missile Support Agency at the White Sands Missile Range, N. M., in February, 1959.

Opinions stated or products advertised in this issue do not represent the official position of, or reflect endorsement by, the Department of the Army or the U. S. Army Signal Corps.

Telephony

THE JOURNAL OF THE TELEPHONE INDUSTRY
Since 1901

June 18, 1960

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Published every week on Saturday by TELEPHONY PUBLISHING CORP., 608 S. Dearborn St., Chicago 5, Ill. Entered as second class matter at the Post Office at Chicago, Ill., under the act of Mar. 3, 1879. 30c per copy (except special issues—50c). Subscription $4.50, 1-year; $7.00, 2-years; $9.00, 3-years. Add $1.50 per year for postage to Canada and Pan American countries; $2.00 per year to Foreign countries. Telephone WAbash 2-2435.

INPUT
48 volts DC
from exchange battery

OUTPUT
24 volts DC
15 amps., 350 watts

THE *New* LORAIN BAT-TAP

another FIRST from LORAIN!

the only device delivering 24 volts DC

with full efficiency, full battery protection

NO POWER LOSS

Voltage reduction by CEMF cells or resistors wastes half the power used. Bat-Tap prevents this loss.

PROTECTS BATTERY

Voltage reduction by tapping the battery causes uneven charging and discharging of cells, unless an extra 24-volt charger is used on the cells involved. Bat-Tap protects your battery, needs no extra equipment.

NO MOVING PARTS

The Lorain Bat-Tap uses a new transistorized inductor arrangement combined with silicon diodes. 48-volt DC is first converted to AC, then to 24-volt DC in a simple, foolproof circuit.

SAFE ON OVERLOADS

Bat-Tap easily withstands intermittent overloads up to 30%.

FULL EFFICIENCY

Efficiencies are as high as 80 to 89% from 25% of rating to 30% overload. Efficiency at full load is 87.5%.

RATINGS

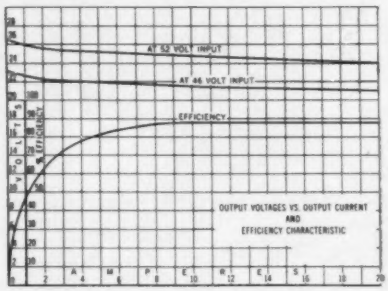
Model QB15A

Input: 44-52 volts, 0.5 ampere no load, 8 amperes 400 watts full load.

Output: 21-27 volts at full load of 15 amperes, 350 watts.

Regulation: 1.5 volt drop from 1 ampere to 15-ampere load.

Filtered input and output (output filtered to 2 millivolts).



EASY INSTALLATION

Bat-Tap requires only simple external connection of input and output leads. Fits 19″ relay rack. Height 6¾″. Depth 9¾″. Weight 32 lbs.

ZERO MAINTENANCE

The Lorain Bat-Tap never needs attention. There is nothing to wear out or need adjustment. Install it and you can forget about your 24-volt power supply.

POWER EQUIPMENT FOR COMMUNICATIONS AND INDUSTRY

our equipment is sold through leading telephone distributors

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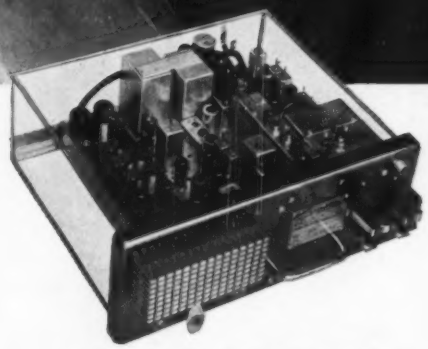

Mobiltel Manual subscriber station equipped with optional transistorized power supply with 12-volt input. Compact 14" case easily fits in trunk compartment.

ALL YOUR
COMMUNICATIONS NEEDS
FROM ONE
DEPENDABLE SOURCE

NOW "READY TO GROW" IN YOUR TERRITORY

Lenkurt Mobiltel mobile telephone systems are here *now* . . . both manual and automatic . . . completely new in design, *telephone-engineered* from dashboard to switchboard, ready for telephone company use.

Because of its compactness and reliability, Lenkurt Mobiltel is an easy-to-sell service. It will open up new avenues of revenue for you, in *Mobile Subscriber Service* and *"Fixed-Mobile"* service.

Subscriber equipment will operate from a standard car battery or from 110 volts a.c. An optional *transistorized* power supply reduces battery drain. Receivers and transmitters of subscriber and base-station assemblies are easily interchangeable for maintenance.

Lenkurt Mobiltel Manual provides a completely integrated system, from telephone switchboard to subscriber equipment, and is fully compatible with Bell System service. Mobiltel Automatic serves dial exchanges where operators are not available.

Complete Mobiltel "packages" can be furnished in common-carrier frequencies and various power outputs – custom-tailored for large or small communities. Available on an "Engineer, Furnish, and Install" basis, if you require it. For the full story, ask your Automatic Electric representative for Circular 901-P4, or write Mr. T. B. Collins, Director, Carrier & Radio Sales, Automatic Electric Sales Corporation, Northlake, Illinois.

AUTOMATIC ELECTRIC GENERAL SYSTEM

Subsidiary of

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PHILCO MICROWAVE
COMMUNICATIONS SYSTEMS

Assure dependability and economy in
Telephone Communications and
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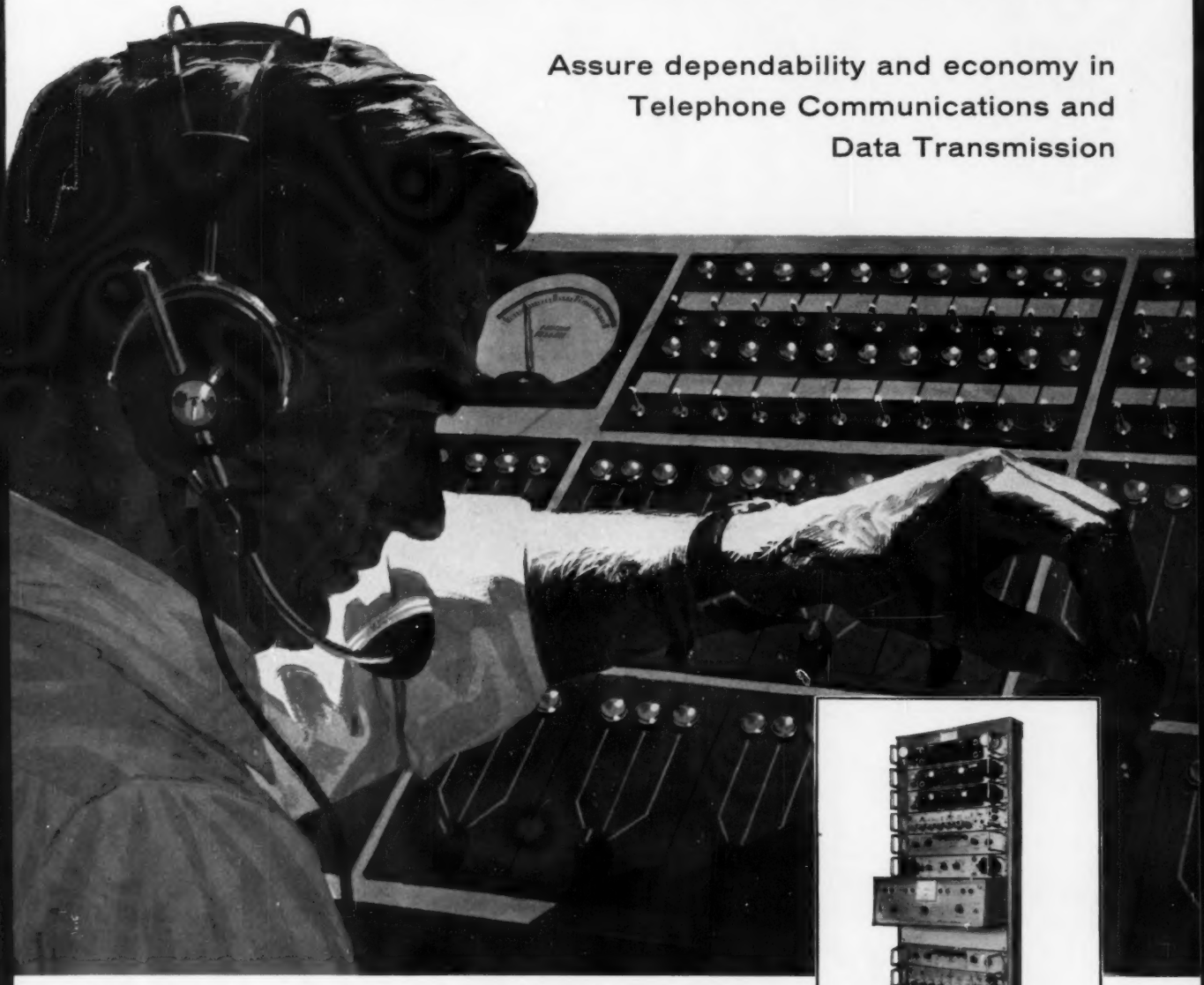

Philco microwave systems are known for dependability, flexibility and economy. Custom designed to meet each specific requirement—and featuring Philco's time-proved CLR-9 duplex microwave terminal—these systems are providing highly reliable, unattended point-to-point communications facilities for voice and teletype . . . plus high speed data transmission. For the finest in microwave systems . . . specify Philco.

Benefit, too, from Philco's efficient TURNKEY SERVICES which include . . . Site Survey • System Planning • Installation • Field Service. We welcome your inquiries.

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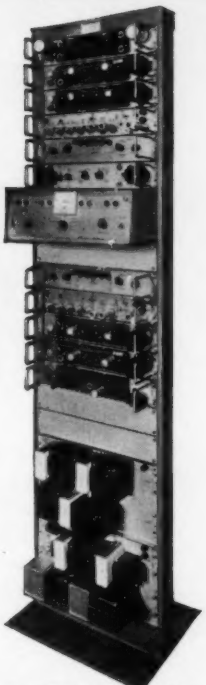
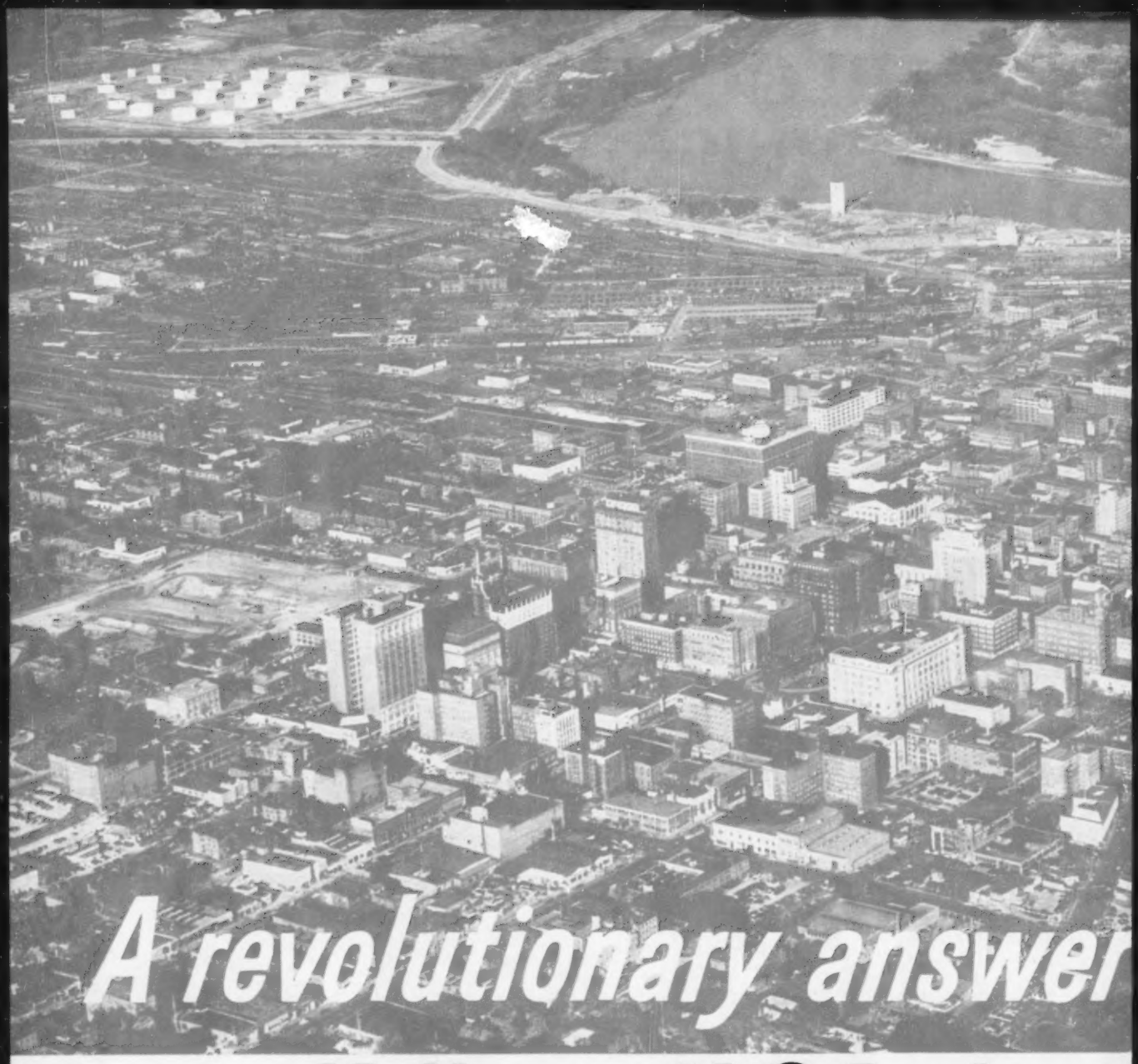


Philco CLR-9 Microwave Relay . . . with 240 voice channel capacity. Available in Common Carrier, Industrial and Government bands.



Kellogg K-24 short

Kellogg's K-24 Synchroplex Carrier fills an important gap in carrier systems: now telephone companies have a simple economical solution at their disposal to *any* expansion problem. With the K-24 you get economical telephone circuits over relatively short lengths of exchange or toll cable: it provides 24 channels on two cable pairs at distances as short as 10 miles or less.

Kellogg's K-24 has been tested and accepted by the country's largest telephone systems. It is equally adaptable to underground or overhead cable lines. Its unique features lead to substantial economies where expanded cable service is indicated. The K-24 is completely transistorized; components of each unit use etched-wire circuitry; mounting is very compact and flexible.

Rounding out the Kellogg Carrier picture are the K-31 for rural subscriber service and K-32 trunk carrier. Each provides dependable, economical expansion over existing facilities. For complete technical details, fill in the coupon below. At the same time you may arrange for an appraisal of your carrier needs by a Kellogg expert, if you so desire.

Kellogg Switchboard and Supply Company, 6650 South Cicero Avenue, Chicago 38, Illinois. Communications Division of International Telephone & Telegraph Corporation.

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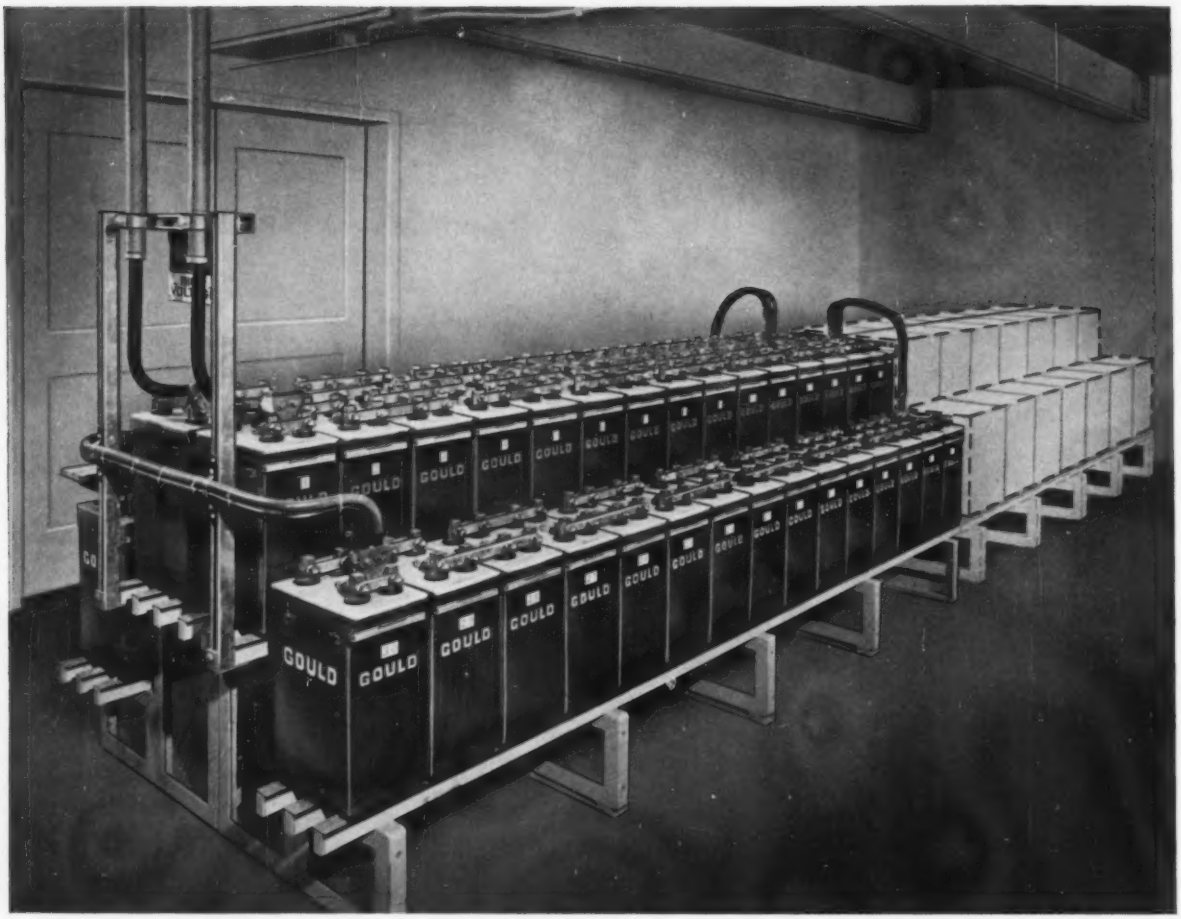
☐ K-24 ☐ K-31 ☐ K-32 Carrier Systems
☐ Please arrange to have an engineer call to appraise our Carrier needs

Name_____

Title_____

Company_____

Address_____



Save 30 to 40% floor space . . .

. . . with new GOULD Stationary Batteries

Gould Stationary Batteries in Plastrite Jars save you 30 to 40% floor space. This means you can increase your battery room capacity without increasing the room size!

Gould Stationary Batteries in Plastrite Jars are lighter, easier to handle. Higher tensile strength protects the jars from shipping abuse. Higher elongation characteristics, greater resistance to heat prevent warping and bulging.

Gould Stationary Batteries have a new Silicone O-ring post seal which prevents escape of electrolyte . . . new stronger posts assure full current carrying capacity . . . new element suspension eliminates cover breakage due to weight of battery element.

Gould Stationary Batteries in Plastrite Jars are available in Planté, Calcium, or Kathanode. Write for details today, or call your local Gould office listed under "Batteries—Industrial" in the Yellow Pages. Gould-National Batteries, Inc., Trenton 7, N. J.

In Canada, write to Gould-National Batteries of Canada Ltd., 1819 Yonge Street, Toronto, Ontario.

New Stationary Batteries in Plastrite Jars offer the same long life for which Gould has always been famous.

More Power to you from **GOULD**

Mission of the U. S. Army Signal Corps

TO PLAN, direct and supervise signal communications, electronic, pictorial and cryptologistic activities of the Army; to develop communications, electronic, pictorial and, within the established national policy, communication security systems, services and material; to provide and service signal material, communications and communication security devices, electronic devices (including those for Army aviation and combat surveillance), meteorological devices (except those for which responsibility is assigned to other agencies); and related activities (except for that weather forecasting performed for the Army by the Air Force) required for the Army and, as assigned, for the Navy, Air Force, and other governmental agencies and for foreign aid programs; and to administer and operate the U. S. Army Alaska Communication System.

MAJOR GENERAL R. T. NELSON,
Eighteenth Chief Signal Officer

The career of Major General R. T. Nelson exemplifies the role of the U. S. Army Signal Corps as both a combat arm and a technical service.

General Nelson, the 18th Chief Signal Officer, is a combat veteran of both World War II and Korea.

A 1928 U. S. Military Academy graduate, General Nelson was Deputy Signal Officer of the 15th Army in France and Germany. He played a major role in restoration of combat Signal capabilities and equipment in the sudden breakthrough in the Ardennes and the subsequent Allied counter-offensive. He also worked on Signal tasks relating to occupation of the Bremen-Bremerhaven Enclave and the Berlin District.

General Nelson, as first commanding general of the U. S. Army Electronic Proving Grounds, Fort Huachuca, was responsible for the major expansion and construction of facilities for the growing technical activities, housing and support needs. He went to Korea as Eighth Army Signal Officer, and provided experienced direction of Signal operations, after contributing much to the accelerated Signal training brought about by the Communist attack in Korea.

General Nelson has been awarded the Legion of Merit, the Bronze Star Medal, the Purple Heart, and the Korean Ulchi with Silver Star.

MAJOR GENERAL EARLE F. COOK
Deputy Chief Signal Officer

Major General Earle F. Cook, a 1931 U. S. Military Academy graduate, who has been Deputy Chief Signal Officer since July 1959, has held several important research and development posts before his present appointment. He has been assigned to responsible positions embracing such fields of Army Signal Corps work as Army communications, electronic equipment and systems and meteorological devices. Some of his activities included the direction of Army Signal Corps effort on space age development.

The first solar conversion for satellites—used with Vanguard I—and the Cloud Cover Satellite—Vanguard I—were developed at the U. S. Army Signal Research and Development Laboratory, Fort Monmouth, while he commanded the laboratory from 1955 to 1958. General Cook directed Signal participation in Project SCORE, the "talking satellite" that carried the first voice from space, President Eisenhower's 1958 Christmas message.

He also served in operational Signal assignments during and following World War II, including White Sands, Fort Huachuca, Signal Intelligence and the European Theater of Operations.

General Cook has been awarded the Legion of Merit, the Commendation Ribbon with Metal Pendant and a number of citations.

A CENTURY OF U. S. ARMY SIGNALS 1860-1960

Centennial Message From the Chief Signal Officer U. S. Army Maj. Gen. R. T. Nelson

THE UNITED STATES Army Signal Corps celebrates its 100th anniversary this year. It has been a century of Army progress in the science of communication. We have advanced from signaling by flag, torch and telegraph along the Potomac and at Manila Bay to a communications satellite relaying messages from outer space.

Since our beginning under Brig. Gen. Albert J. Myer, the Signal Corps has provided military signaling systems to the Army and operated them in combat. Our achievements have supported not only American fighting men, but civilian endeavors at home and abroad.

We are proud of our age. We are prouder still to be the communications-electronics arm of a never-beaten Army whose victories have always advanced the cause of assuring men their natural, God-given rights.

All Signal Corps personnel—Active, Reserve, and National Guard—military and civilian—have unselfishly contributed to the military posture of an ever-modern Army and the nation. They have given of their talents and their knowledge. They have given of their courage and their lives.

Signalmen were at Bull Run and Gettysburg—separated only by their uniforms and their convictions. One of our Medals of Honor was earned outside Manila, carrying communications forward under fire. Men with crossed flags on their collars fell in France, in North Africa, and the Philippines. And Signalmen were among the very first to give their lives in Korea.

We have a distinguished heritage in executing our dual mission as a combat arm and a technical service: The Myer flag and code system, his flying telegraph train, the Beardsley magneto telegraph, the nation's first weather service, Alaskan communications, the first military airplane, the first American radar, the first operational electronic air defense system for Army missile batteries, the first weather satellite, and the first communications satellite, are but some of the Army Signal Corps' contributions to our country.

The United States Army's superiority in battle is sustained by fire-power, mobility and command control. While supporting all three, it is to the last that the Signal Corps is primarily dedicated—through strategic and tactical communications, combat surveillance and target acquisition, pictorial support, electronic warfare, avionics for Army aircraft, and in the broadening field of space and satellite electronics and communications.

Aware of the nation's inherent need for the Army and the requirement that it be kept highly modern, we are—together with American industry—engaged in research, and development of equipment and in training in its use, which we believe will add new dimensions to the nature of communications itself.

As we enter our second century, our energies will continue to be dedicated to increasing the Army's combat readiness. We firmly believe that improved communications among the people of the world proportionately advance the cause of peace. And, in helping to bring about a greater exchange of ideas and understanding, we find our most enduring source of pride.

It is my privilege to be Chief Signal Officer of the Army in this 100th year of our service. To the military and civilian members of the U. S. Army Signal Corps throughout the world, I offer my heartiest congratulations for the jobs you have done and my best wishes in your future undertakings. You and those before you have made our successes. You are the *people* who aggressively face a challenging future.

Good luck, happiness, and God bless each of you in this great Corps. I look to your individual skills and dedication to perpetuate the spirit of *pro patria vigilans*—For our country, ever vigilant.

Brig. Gen. Albert J. Myer, First U. S. Army Chief Signal Officer

A CENTURY *of U. S. Army Signals*

MARKING 100 YEARS of Army signals on June 21, 1960, the U. S. Army Signal Corps celebrates a century of service to the Army and the nation.

From colored signaling flags to a communications satellite relaying voice and teletype messages in outer space, it is a unique record: the first independent signaling organization of the military; the first such organization to support the Army in wartime; and the first of its kind in many other respects. It has been responsible for civilian as well as military communications advances.

The founding of the Signal Corps as a separate branch is attributable to an Army surgeon, Major Albert J. Myer, whose interest in helping the deaf led to a system of sign language between military outposts.

Authorized as Signal Officer of the Army on June 21, 1860, Major Myer filled a unique position as director of the first full-time signaling function of a national army.

At once he began to build a corps of signalmen whose services during the Civil War proved so invaluable that a formal U. S. Army Signal Corps was established in March of 1863. The orange color distinguished by the historic Army dragoons, who were redesignated cavalry, became the branch color of the new Signal Corps. The new Corps was to serve as both a combat arm and a technical service, a dual role continued to this day.

Major Myer's signalmen employed the wigwag flag by day and torches by night, waving them in a code system, watching and reading through telescopes between companion stations. The system was effective in fixed lines along the Potomac River above and below Washington, and in tactical actions throughout the war.

Major Myer also had ideas of putting the electric telegraph into the field service of the Army. Civilian telegraphers, directly controlled by Secretary of War Stanton—and paid by the quartermaster, were from the start of the war employed in the military effort of the North. This was the U. S. military Telegraph, which provided command and administrative communications between major headquarters.

But Major Myer wanted tactical electric telegraph which could be moved about for free employment in the field, when visual signals could not be used. Working with civilian inventors, he brought about the development of the Army's first electrical communication device, the Beardslee magneto-electric telegraph set.

Hand-operated (without batteries) and readily portable, it could signal over several miles of insulated field wire, which soldiers laid rapidly over

the ground or strung on lance poles. They called it the "Flying Telegraph."

Assisted by officers and men detailed to him, Major Myer provided more and more military communications as the Civil War developed. Visual signals figured prominently in amphibious actions along the southern coasts, at Bull Run, Gettysburg, and Allatoona; and in the assaults on Richmond, in 1862 and in 1864-1865. The Beardslee magneto-electric telegraph and the "Flying Telegraph" Trains played a part in the Peninsular campaign and at Fredericksburg in 1862.

In 1863, Secretary Stanton ordered Major Myer to turn all electric telegraph operations over to the Military Telegraph organization in a disagreement which led to the temporary removal of Myer, then a colonel, to the Department of the Mississippi. A year later, the acting Chief Signal Officer, Lt. Col. W. J. L. Nicodemus, was replaced by Col. B. F. Fisher.

Signal Corps officers who made ascent in balloon in 1908 at Gas House Field, Southeast, Washington, D. C.

Captive military balloons, a logical uplifting of elevated observation and signal platforms, were not an Army Signal Corps assignment in the Civil War. In mid-1863 the Army offered its rather uncertain balloon activity to the Signal Corps, and Colonel Myer refused it on the grounds that he did not have enough men or money. So the Army dropped balloon operations altogether until 1892 when aeronautics and military ballooning were resumed—a responsibility of the Army Signal Corps.

After the Civil War and Secretary Stanton's departure, the War Department restored Colonel Myer as the Chief Signal Officer. In 1867, he gained control over the command and operation of all Army telegraph lines—including lines linking isolated camps and posts. The Corps built and maintained increasingly longer wire lines operated by key and sounder, using battery-powered current, and the Corps also provided "Flying Telegraph" trains to each Army Corps.

As the nation pushed deeper into western territories, and as Army outposts sprang up in Indian country, the Army Signal Corps erected more telegraph lines, reaching a peak of about 5,000 miles of lines by 1880.

Meanwhile, a most unusual assignment had come to the Corps. Congress in 1870 authorized a national weather service and assigned it to the War Department, whose Army Signal Corps telegraphers at outlying posts offered a ready and inexpensive means of simultaneous weather reporting from coast to coast. The weather service of the Corps grew rapidly, soon comprising hundreds of reporting stations from the Atlantic to the Pacific and in adjoining areas of Canada and the Caribbean. Regular weather reports and storm warnings became a popular and demanded routine, and included exchange of weather data with foreign nations and the beginning of international cooperation in large-scale scientific efforts.

After the death of General Myer in 1880, the Army Signal Corps, under Brig. Gen. William B. Hazen, participated in the First Polar Year, an international effort to learn more about the Arctic. This cooperative endeavor constituted what was in fact the first geophysical year.

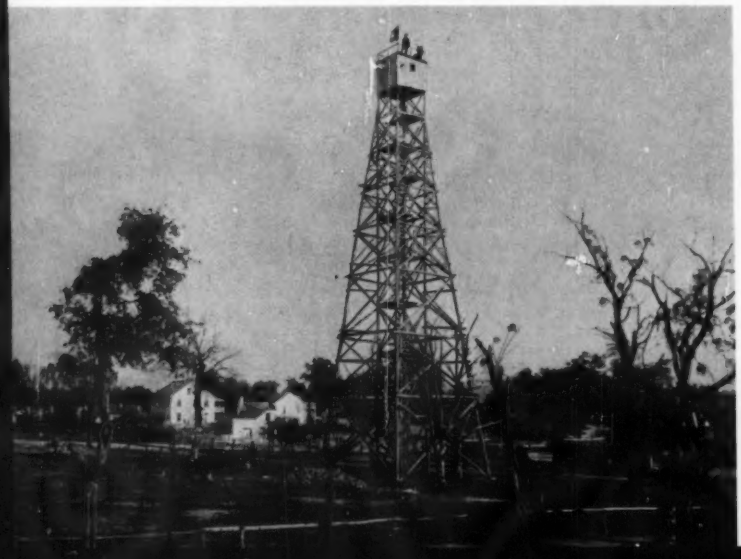
In 1881 Gen. Hazen sent out two expeditions, one to Point Barrow, Alaska, the other to Lady Franklin Bay on Ellesmere Island, opposite northern Greenland. The 10 men of the Point Barrow party returned safely in 1883 with a complete set of scientific observations during the Polar Year.

The 25 men of the Ellesmere Island team under Lt. A. W. Greely likewise maintained regular records of weather and polar phenomena and explored hitherto unknown areas in the vicinity.

A party under Lt. J. B. Lockwood in 1882 reached the point furthest north attained by white men to that date. But the southward return of Greely's group met tragedy. Navy ships intended to pick them up were blocked by ice packs in the Greenland channel for two successive summers. Not until 1884 did a rescue ship get through, to find only seven survivors, the others having starved to death. All the scientific records were saved.

Upon the death of General Hazen in 1887, Greely, then a captain, world re-

One of the many Signal towers erected during the Civil War which brought a greater degree of command control to the operations of the U. S. Army than ever before. This tower was built at Jacksonville, Fla., in December 1864.



Signaling for reserves to advance after the retreat of the Spanish at Fort Malate, Manila, in the Spanish-American War.

nowned for his Arctic service, was promoted to brigadier general and to Chief Signal Officer. With his scientific bent of mind and vigorous support of military communications and innovations, he kept the Army Signal Corps intact during a decade of effort to disband the Corps, especially after Congress decided that the weather service was too civilian in character to remain in the Army. The Department of Agriculture took over this service as the Weather Bureau in 1891.

Meanwhile, new modes of communication had come to the Army—the heliograph and the telephone. Immediately after the loss of the weather function, the Army resumed interest in military balloons. In 1892, General Greely won War Department consent for the assignment of this responsibility to the Signal Corps.

He also promoted military uses of photography, having taken the Army's first photographer, Sgt. George W. Rice, to the Arctic in 1881-1884. Sgt. Rice's photographs, though he himself was among those who starved to death early in 1884, were all preserved.

By 1898 and the Spanish-American War, Gen. Greely was budgeting for photography and providing photographic services to the Army. In that war, the Army Signal Corps provided telephones, as well as telegraph lines, on the combat front in Cuba. The Corps' one balloon did duty during the assault on San Juan Hill.

Similarly, in the Philippines in 1898, Signal Corpsmen brought up wire communications in the assault on Manila and coordinated by means of wigwag the fire of the Navy's warships in Manila Bay.

The crossroads in Argonne Woods, near Montfaucon, Meuse, France, showing an important switchboard, during the advance through the woods, by the U. S. Army in World War I.

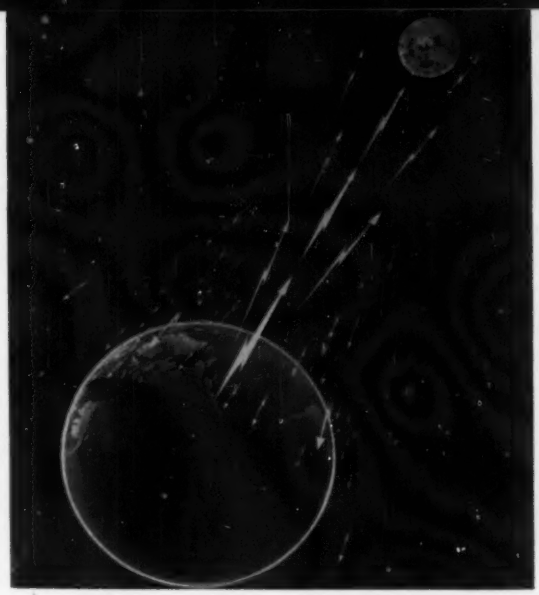
Following that war, the Corps installed extensive wire lines, both in Cuba (also in Puerto Rico) and in the Philippines. In the latter area, a great deal of underseas cable was also laid to link up the major islands.

In 1900, Congress assigned to the Army Signal Corps responsibility for communications to and in Alaska—cable and wire lines serving not only military garrisons there, but all civilian needs as well, to the benefit of mining and fishing interests and other settlements scattered throughout the territory. Radio, or wireless telegraphy, was introduced into the Army by the Signal Corps. One of the first military circuits employing this new technology was a 100-mile link across Norton Sound to Nome, Alaska, obviating a difficult land line or underwater cable route to that outlying settlement.

In 1906, General Greely concluded his long service—nearly 19 years as Chief Signal Officer. There fell to his successor, Brig. Gen. James Allen, the task of introducing airplanes to the Army.

The success of the Wright airplane in 1903 led to the formation of the Aeronautical Division in the Signal Corps in 1907—and a contract with the Wright brothers for an airplane to meet Army specifications. The plane made its initial flight at Ft. Myer, Va., on September 3. In the course of subsequest flight tests, this airplane crashed on September 17, severely hurting the pilot, Orville Wright, and fatally injuring his passenger, 1st Lt. Thomas E. Selfridge, a Field Artillery officer on duty with the Army Signal Corps for aviation service—the first man ever to die in heavier-than-air powered aircraft.

The next plane which the Wrights built to meet their Army contract was delivered in 1909.



Artist has created conception of manner in which U. S. Army Signal Corps personnel at Fort Monmouth, N. J., made radar contact with the moon early in 1946. Pulsations of transmission and reception are indicated with arrows.

In 1913, Brig. Gen. G. P. Scriven, Gen. Allen's successor, inherited an expanding variety of Army Signal Corps activities. These included field radios, aircraft radios, increasingly elaborate long-range wire, cable and radio circuits, and fire control systems for directing the fire of large guns on targets visible only to remote observers. A month before the United States entered World War I in 1917, Brig. Gen. G. O. Squier became the Chief Signal Officer.

General Squier built up the Corps tremendously, from fewer than 2,000 officers and men to over 50,000 by the close of 1918. A permanent Army Signal Corps post at Ft. Monmouth, N. J., was begun as Camp Alfred Vail, centered on a nucleus of signal schools and laboratories. (Earlier signal schools had been located at Ft. Leavenworth and at Ft. Myer, named in honor of the Corps' founder, soon after his death in 1880, and bearing his name today.)

General Squier induced the world-renowned physicist, Dr. Robert A. Millikan, to come from the University of Chicago to head up Army Signal Corps research and development activity. Many new kinds of equipment, particularly vacuum-tube radios, were designed and produced by industry.

In France, the outpost companies of field signal battalions provided all telephone, telegraph and radio service down to the barbed wire, while signal telegraph battalions built heavy-duty communication lines across the country. In Paris, the Signal Corps maintained a laboratory in which worked such scientists as Maj. Edwin H. Armstrong, who developed the superheterodyne circuit during his overseas service, and who later invented frequency-modulated radio. One of the scientist-officers whom Gen. Squier brought into the Corps was Maj. William R. Blair who was placed in charge of the considerable meteorological activity maintained by the Army Signal Corps in France to serve the needs of fire control and aviation.

U. S. Army aircraft continued as a Corps responsibility until the War Department took aviation out of the Signal Corps in May, 1918, setting it up as the Air Service—which later became the Army Air Corps.

Army photography became an increasingly important Signal Corps function during World War I, expanding to include motion pictures and training films so necessary to train quickly large numbers of recruits.

During the decade of inevitable military shrinkage after World War I, and the ensuing decade of the depression, one Chief Signal Officer after another, Maj. Gens. C. M. Saltzman, G. S. Gibbs, I. J. Carr, J. B. Allison, and J. O. Mauborgne, struggled to maintain, against oppressive shortages of money and men, a skeletal Signal Corps. They promoted new developments in wire and radio, and brought out a steadily improving series of SCR (Signal Corps Radio) numbered sets of ground and airborne radios. They improved the War Department radio net and Army communication links within the continent and beyond—to such outlying posts as Hawaii and Panama.

General Mauborgne, a research-minded chief, especially supported the highly secret beginnings of Army radar, which Colonel Blair, director of the Army Signal Corps Laboratories at Ft. Monmouth since 1930, had initiated. Col. William R. Blair holds the fundamental and basic patent for American radar. From the Signal Corps' pioneering in the development of our country's radar have evolved the many radars used in the military and those employed in numerous civilian applications, such as navigation, storm tracking and air lines flight direction and control.

In the years immediately before America plunged into World War II, the Signal Corps promoted Dr. Armstrong's newest contribution to radio, frequency modulation, which soon revolutionized mobile communications in Army combat.

Maj. Gen. D. Olmstead succeeded General Mauborgne a few months before the attack on Pearl Harbor, an occasion when the Army Signal Corps radar SCR-270 on the north shore of Oahu performed properly, detected the Japanese airplanes 130 miles away, and gave the warning, which men would not believe.

At once, General Olmstead received a superhuman task of expansion, which paled the rapid growth of the Corps in

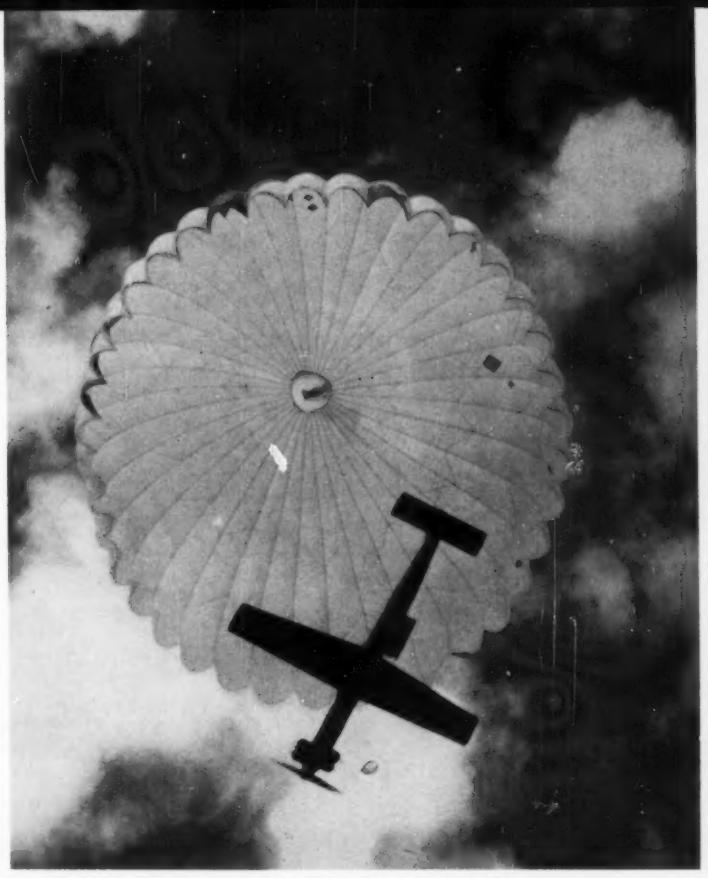
(Continued on page 66)

During the seige of Corregidor, the U. S. Army Signal Corps message center was in lateral No. 12 of the Melinta Tunnel. Behind the partition, right rear, are the code machine and telegraph operators.

FORMER
CHIEF SIGNAL OFFICERS U. S. ARMY

STRATEGIC COMMUNICATIONS for the ARMY

by COL. G. P. SAMPSON
Chief, Army Communications Systems Division
OCSigO



Floating back to earth by parachute after completing its remotely controlled mission as a target for Army surface-to-air weapons, is a drone, tested by the U. S. Army Signal Corps.

NO ONE HAS TO BE TOLD that we are living in an age geared to space technology. In almost every daily newspaper we pick up, the front page carries headlines proclaiming "Discoverer VII in Flight," "Redstone Successful," or some other indication of the advances being made in satellites and missiles.

These advances have had an obvious impact on modern warfare. The military trinity of fire power, mobility and communications are trying hard to keep pace with space science. The military are lagging in communications but are looking to industry to stay with them and provide the needed impetus to a revolution in communications; for it is truly a revolution we need, not an orderly evolution, if the military is to communicate as rapidly as the modern-day machines of war require.

Today the United States Army depends upon the Signal Corps to provide its long-haul circuits from the continental United States to over 70 countries of the world; to every spot, isolated though it may be, where our flag flies over Army troops. It is vast and complex, this Army Command and Administrative Network—or ACAN as it is called by military communicators.

20 Billion Words Transmitted

To provide the more than 1,200 channels required to serve the many users, various radio modes, cable, and wire, including leased commercial means, are employed. During 1959, for example, nearly 20 billion words were transmitted over these facilities. A system of relay stations located at high-message population centers serve as distribution points out of which messages are forwarded to customers in the area or onward to other relay points.

Key stations are located in density areas near such places as Heidelberg, Germany; Honolulu, Hawaii; Anchorage, Alaska, and others. In the United States, key ACAN stations are located in each of six Army areas with automatic relay stations on the West Coast, in the Midwest and, soon to be activated, on the East Coast.

A typical station serves the Pentagon in Washington, D. C. and lesser headquarters in that general area. To provide total facilities, a transmitter station is located in Virginia, a receiver station in Maryland, and a facilities control and communications center in Washington. These dependent parts are tied together by both wire and radio to provide, together, a Primary ACAN station.

32 Transmitters in Use

The Virginia antenna farm covers more than 620 acres and uses more than 20 three-curtain rhombics on 150-foot poles. Some of the other antennas include vertical arrays, and rotary beams. The transmitters are 32 in number, ranging from 500 watts to 300 kilowatts in power. Radio-teletype, multiplex, sideband and microwave are some of the radio modes employed.

In Maryland, on an area of more than 500 acres, conventional diversity receiving antennas are the primary means of reception. More than 80 receivers are in operation.

One of the antennas is unique. It is a tapered-horn, directional antenna of extremely high gain, operating in the frequency range between four and 28 megacycles. A quarter of a mile long at the aperture, it is more than 250 feet high and 500 feet wide. Covering an area of about 7 acres, the antenna has a connecting waveguide 40 feet wide and 80 feet high. It has a 10-degree beam width at half-power points and a nominal gain of about 18 db. Developed by the U. S. Army Signal Research & Development Laboratory, this unusual antenna has an off-beam and side-lobe attenuation of more than 50 db.

This picture of the ACAN system and some of its features is a simple example of evolution. Along with fire power, which has progressed from a 20-mile-range, 8-inch gun in World War II, to the potent 200-mile-range Redstone or the even-further-shooting Pershing missile of today, communications have slowly progressed.

Gear Miniaturized

While the mobility of the Army has increased, the communications gear that the field soldier carries has been miniaturized and microminiaturized to make his load light and his range long. He has small, compact pack sets, portable sets, and vehicular sets for radio, telegraphy, and telephony. He's a fast-moving, hard-hitting fighting man controlled by the communications he carries. But all of the progress was made during, not before, the conflagration for which it was required.

What about the strategic network that ties the combat element to the rest of the world? It has grown, become more efficient, and does a good job.

During the peacetime years following World War I and only just shortly before Pearl Harbor, Army messages transmitted by radio were handled by what was then known as the "Army Radio Network." This network was composed of manual radio (using International Morse Code) and automatic Boehme circuits. The procedures used were mostly commercial with some provisions from the old Army field manual also utilized, but all military traffic was handled on a point-to-point basis within a very limited network.

Tape Relay System Begins

After Pearl Harbor and our entry into World War II, message volume increased so rapidly that it was necessary to expand facilities to meet the unprecedented communication requirements. As a corollary a gradual change in the method of operation from manual routing and point-to-point operation to the semi-automatic tape relay system was begun. This system of handling telegraphic messages is now used by all major networks, both military and commercial, modified of course by special requirements and technical developments.

Early in the war the Army Radio Network was redesignated the War Department Communication System. This change was made when both landline point-to-point circuits and radio facilities were included in the network. Later when the tape relay system became effective, the communication system was named the Army Command and Administrative Network, the designation it holds today.

In August 1941, radio-type (IBM) equipment was developed and placed in use, on an experimental basis, in the old Munitions Building, in Washington, D. C. This equipment was so designed that a perforated tape placed in a roller transmitter at one end of a radio circuit would reproduce at the distant end of the circuit the message in page-copy form. It was not until October 1942 that this equipment was installed for use on several circuits. This was a radical departure from the previous method of handling messages by radio and it was necessary to revise practices and procedures.

Security Becomes Problem

After the outbreak of hostilities, security became a major problem. The implementation and enforcement of strict security regulations created a requirement for a new method by which all message traffic could be handled. It was determined that security, accuracy, and speed of handling—in the order mentioned—were the basis upon which all procedures should be founded. To carry out these provisions, Signal centers were required to censor messages prior to transmission.

As the War Department Communication System grew to include teletypewriter point-to-point circuits throughout the continental United States, the additional circuits in this rapidly expanding teletypewriter system were terminated in teletypewriter equipment utilizing wire facilities exclusively in order that transmission of certain classified information could be made in the clear. Neither time nor personnel were available to handle the tremendous volume of such traffic through cryptographic centers.

In July 1942, the Army Network installed the first tape-reperforator equipment. This equipment was designed so that messages could be received in a printed, reperforated tape form instead of page-copy form, with transmission being accomplished by inserting a previously prepared tape in an associated transmitter-distributor. This was a most radical departure from all previously recognized and established Army methods of message handling.

Retransmission of Tapes

Whereas messages were previously handled directly on a point-to-point basis, with each station receiving each message in page-copy form and forwarding the message by manual means, either by radio or by reperforating a tape for relay to another station, it now became possible to utilize the incoming tape received on the tape reperforator for retransmission to other points as necessary without manual reprocessing.

This development, insofar as Army communications were concerned, had as far-reaching effects as the introduction of the telegraph. Now for the first time, message traffic could be handled with the speed and in the huge volume dictated by modern warfare.

By the middle of September 1942, 11 stations in the net were utilizing tape-reperforator equipment within the continental United States. Since this was an entirely new concept in the handling of military communications, procedures had to be revised to meet the message handling requirements peculiar to tape relay.

Under this new method, all stations with tape relay were now considered to be in direct contact with each other for procedure and traffic handling purposes. This original concept is still valid and has been the foundation of all tape relay procedures.

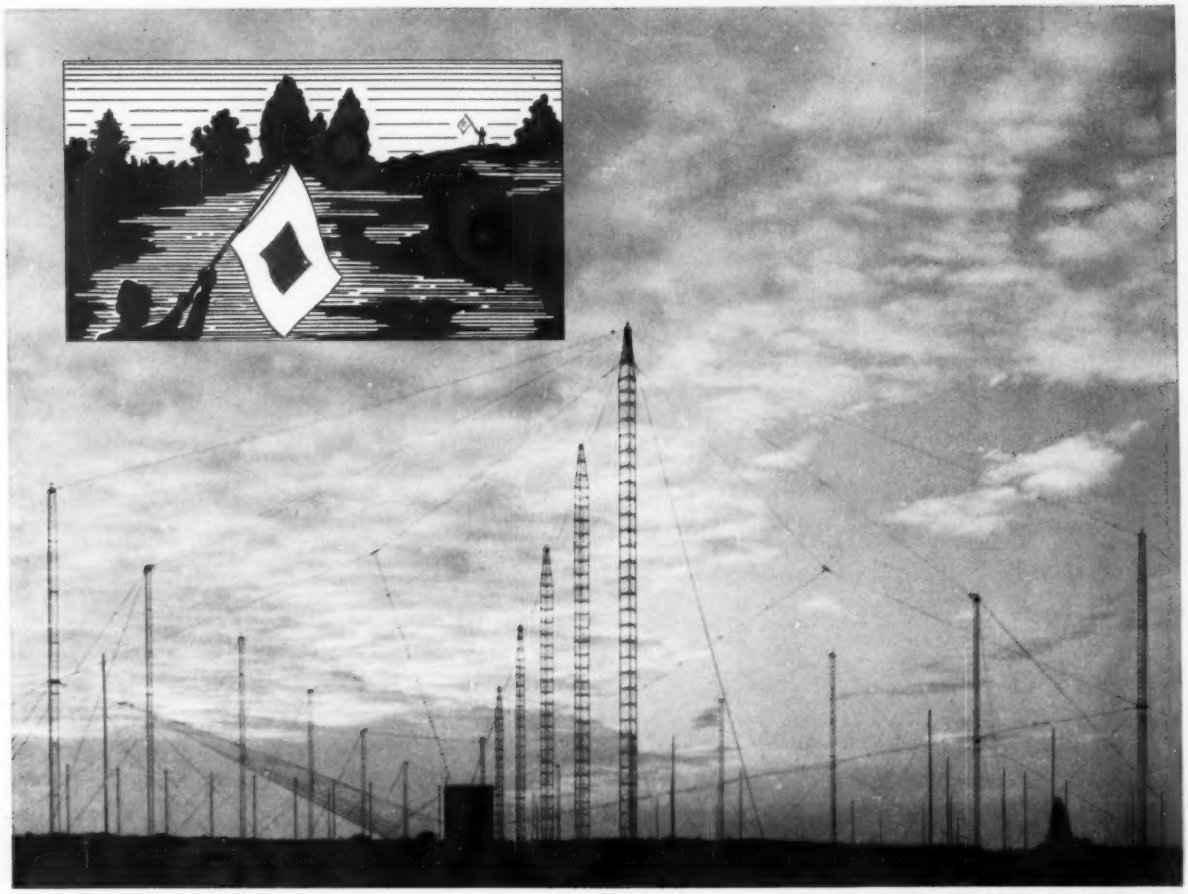
During May of 1943, the first ACAN radio teletypewriter circuit was established. It was between Washington and London and terminated in tape-reperforator equipment at each end. The establishment of this circuit extended the handling of messages by means of tape relay to an overseas location for the first time. This initial facility was the beginning of the gradual conversion of manual radio circuits to the radio teletypewriter circuits we use today.

Space Conservation Problem

The constant expansion during the early part of the war was so great that available space and equipment at installations could not meet the demand. The original tape-reperforator equipment installations gradually became too large and cumbersome to efficiently handle the tremendous volume of United States Army command and administrative messages. There was a requirement for more compact equipment.

Semi-automatic equipment was purchased, installed and placed in operation during July 1943 in the War Department Signal Center to meet this need. The very nature of this equipment was conducive to conserving space and operating personnel. The equipment was manufactured in compact units comprising eight receiving tape reperforators in a single console and 12 transmitters mounted on a table in two rows, one above the other. The compactness of this semi-automatic equipment was ideal for expeditious routing and relay of message traffic. However, operating personnel again had to be trained and new procedures and practices developed and published.

With the advent of semi-automatic



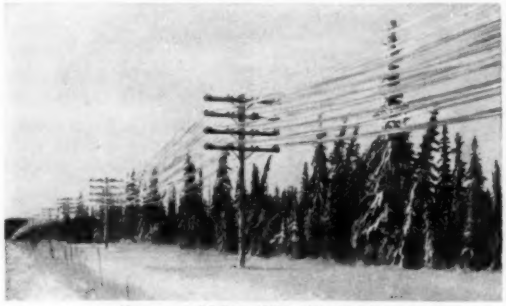
The TAHA, La Plata, Maryland

From Wigwag to TAHA

COPPERWELD Salutes the SIGNAL CORPS' 100 Years of Progress

It started with a hill-to-hill wigwag in 1860—and today, an incredible new directional "ear" can pluck out of a bedlam of static a tiny signal from the other side of the earth. This is a remarkable record of technological achievement by the U. S. Army Signal Corps. Not only has this arm of Uncle Sam contributed to military progress, but it has pioneered many advancements in civilian communications.

Copperweld Wire Products have played an important part in the work of the Signal Corps for over 40 years. The more dramatic installations of recent years have included over 4,000 miles of communication lines in Alaska where Copperweld Wire withstands the terrific punishment of Arctic storms without service interruptions—and the dramatic Tapered Aperture Horn Antenna, known as the TAHA, where millions of feet of Copperweld Wire are used to create a long-range, high-frequency receiving antenna of excitingly new design.



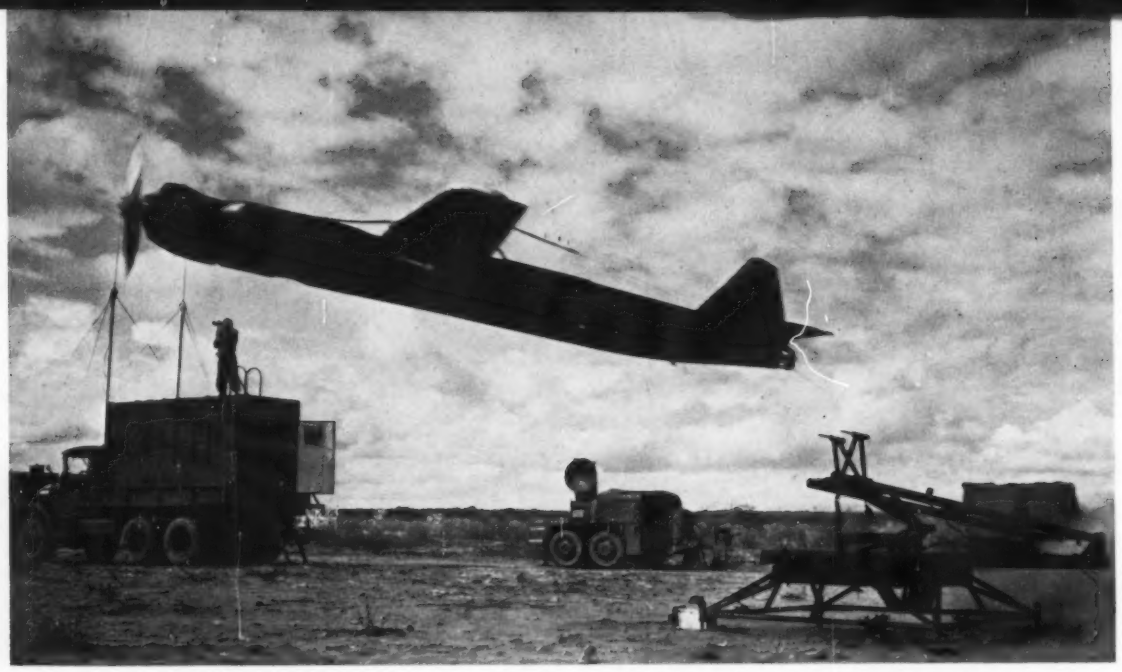
Copperweld Line Wire In Alaska

Developments from Copperweld research, manufacturing skill and know-how will continue to keep pace with the forward march of the U. S. Army Signal Corps.

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, N.Y.



Drone being launched at Fort Huachuca, U. S. Army Electronic Proving Ground.

equipment, the network was then composed of five different types of facilities, namely: manual radio, Boehme radio, radio-type (IBM), tape-reperforator equipment, and semi-automatic equipment. This created still more problems.

Therefore, shortly after the initial installation of semi-automatic equipment had been completed, a survey was made to determine which of the several types of equipment then in use by the Army was most appropriate for adoption as standard. Upon completion of this survey and its recommendation, the semi-automatic equipment was standardized for Army use.

World-wide Radio System

As World War II gained momentum the Signal Corps communications network grew to match the additional requirements placed upon it. Radio transmitter and receiver stations were constructed throughout the world; signal centers "opened for business" in Europe, the Pacific, India and Iceland, until the Army Command and Administrative Network, the ACAN, became literally global. The system grew and the volume of messages increased until at the peak of World War II, more than 1½ billion words were being processed in a year. It would take one teletypewriter, operating continuously, over 50 years to record these words.

Between World War II and the Korean conflict, traffic dipped slightly but once American troops were committed, messages increased to today's level and stood relatively steady.

From the foregoing, it becomes apparent that communications are here to stay, to grow, and to become faster, more reliable, and more secure if they are to serve the purpose for which they are intended.

What is the Army doing about it? How will we provide the speed? How can we dispel the lack of reliability ever-present in high frequency radio transmission?

The Army Signal Corps is in the midst of a project called UNICOM—Universal Integrated Communications—a concept designed to accommodate all modes of information transfer such as data, perforated tape, television, facsimile, computer, telephone or magnetic tape. Speed will be accomplished through automatic circuit switching providing user-to-user service. The system will incorporate error control and automatic encryption. Using wideband transmission, the system uses standard signals and components.

UNICOM Reality in 1967

UNICOM is a going project and should be a reality by 1967.

The Army is going all out to defeat the unreliability of radio—the scourge of atmospherics and blackouts. An intercontinental trunking capability of highly reliable proportions is a must.

Recognizing this fact, we are applying considerable effort aimed at a solution to the intercontinental trunking problem. The most promising approach is our communication satellite program. We have two programs under way—one to develop a Delayed Repeater communication satellite and the other to develop a Real Time repeater communication satellite system.

The code name for the Delay Repeater satellite system currently under development is the COURIER.

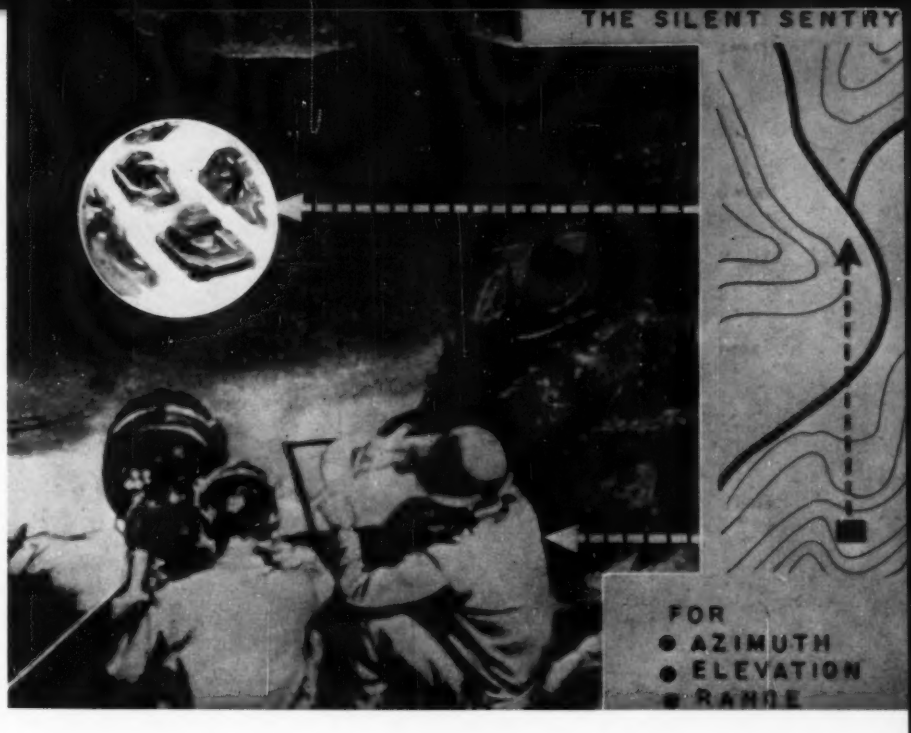
To give you an idea of how the system will work, information in the Pacific area from various users would be collected at the ground relay station in Hawaii and stored on high-speed magnetic tape equipment. When the COURIER communication satellite passes near Hawaii on its equatorial orbit, the information stored at Hawaii would be transmitted to the satellite and stored there. The satellite would then proceed on its orbit carrying the information collected from Hawaii.

While passing over Puerto Rico, the satellite would be interrogated to determine whether the satellite has any information destined for Puerto Rico. The information for Puerto Rico would then be transmitted to the ground and stored there for distribution.

COURIER for Bulk Traffic

As you can see, the COURIER concept produces an inherent delay in communicating between two stations because of the physical transit of time of the satellite itself. This is not considered a serious problem because it is

(Continued on page 72)



Radar provides detection and range data — almost independently of weather and darkness. This set—the SILENT SENTRY —is a pulsed Doppler radar, a component of the combat surveillance system. It can locate a moving man at a range of 1,500 yards. And it can detect a moving vehicle at 5,000 yards.

Command Control From 1860 to 1960

by COL. W. M. LAUTERBACH
Executive, OCSigO

AS IT ENTERS its 100th year, the U. S. Army Signal Corps has a history which has played a vital role in the advancement of the nation, both in the military and civilian spheres, through progress in communication science.

A pioneer in at least a half-dozen communication-electronics areas, the Army Signal Corps has developed equipment and techniques adopted by civilian agencies and individuals, as a benefit to the entire American civilian community.

Tested at Ft. Monmouth

Yet, while ever-striving to advance the science of communication, the U. S. Signal Corps is earnestly dedicated to its role in increasing the Army's combat effectiveness through better communications and electronics.

Some of these new developments in combat communications and electronics are undergoing study at the Army Signal Research & Development Laboratory at Fort Monmouth, N. J. Some are being field tested at the Army Electronic Proving Ground at Fort Huachuca, Ariz., and will soon go into full production.

Success on any battlefield demands *mobility* of our combat forces. They will have tremendous ranges of firepower. The successful employment of this firepower and mobility on the battlefield makes effective *command control* a compelling issue.

Three major elements of command control have importance to the communications industry as well as to the Army's mission: (1) Communications, (2) avionics, and (3) combat surveillance.

Other significant efforts—such as electronic warfare—also contribute to better command control. However, the first three significantly reflect some of the representative changes in the modern Army.

Army communications will link more combat units of smaller sizes over greater distances than ever before.

"Indispensable Man" Factor

Proponents of machine-run warfare are today confronted with the fact that the ultimate decisive factor of war is still the indispensable man. Whether he is fewer in number, or moves faster in smaller formations, is not the issue. He is still the basic military unit who must control and be controlled by a means of communication. His equipment and systems must be smaller and lighter, but big enough electronically to do the job in locations and circumstances of forward combat.

To briefly illustrate new tactical equipments and systems, another capacity of the U. S. Army Signal Corps —photography—may be useful in describing some of these combat-type communications. The accompanying photographs show new equipment.

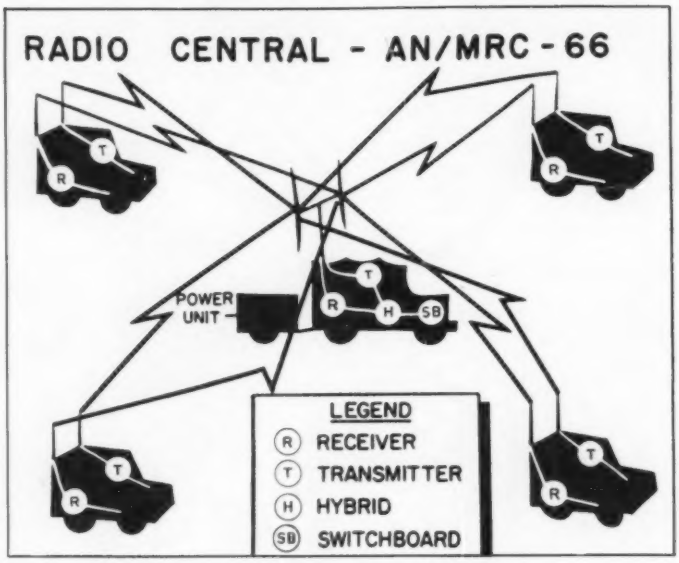
Also in support of the combat area communication system are similar facilities that interconnect to higher echelons — rearward to the continental United States and laterally to adjacent combat and support areas.

The long-range concept for the Theater Army Support Communication System is called UNICOM—Universal Integrated Communication System. It is

universal because it will integrate all communication services in a single system. Basically it is an automatically switched network that is equivalent to an intercontinental toll-dialing system —and it also permits control of electronic aids to command control over the network facilities.

These are fundamental concepts for future theater Army support and strategic Army communication systems. Other features are necessary. Where possible and practical, facilities will be mobile or transportable. They will be mounted to permit retrieval from contaminated areas—and to allow the system to follow the emphasis of battle with the least possible delay. Facilities will be dispersed and protected instead of, for example, constructing our large radio stations in above ground buildings.

Facilities will be dispersed to small buried, or semi-buried installations—remotely controlled from a protected control center. Each installation will have sufficient flexibility to permit reassignment within the system in order to continuously maintain communications.



Radio Central (AN/MRC-66) provides 18 single-sideband voice channels on a single carrier frequency—with selective calling. As many as 36 subscribers can be accommodated on a two-party basis. Operation is on a full-duplex basis equivalent to using a dial telephone.

Aerial Vehicles

The use of Army aerial vehicles in direct support of ground operations is accepted military doctrine. These Army aerial vehicles will play an important role in modern warfare.

Whether fixed-wing or rotary-wing, they operate in a somewhat different environment from that of the high-performance aircraft of the Navy and Air Force. They operate close to the ground, under visual and non-visual weather conditions, in the nap of the earth—barely skimming treetops. The Army pilot must not only fly the craft, but must also act as navigator, flight engineer, communicator and observer.

He needs all the electronic assistance he can get, particularly under non-visual flight conditions. From this requirement the term avionics has evolved —equipment and systems for navigation, communication, flight control, identification, instrumentation, and other aircraft electronic functions.

The requirements are somewhat similar to those of large aircraft, but the equipment must meet premium performance characteristics, space and weight limitations and require minimum operating manpower.

New and appropriate airborne sets to meet these needs are under development to provide the Army aviator with electronic navigation.

One of these is a self-contained enroute navigator, embracing the Doppler radar principle, and using limited radiation from the aircraft. This equipment will help meet the important requirement of independence from ground-based radio navigation aids, and will automatically guide Army aviators to pre-selected destinations accurately and dependably.

Also under consideration is an anti-collision device to provide the pilot with sufficient visual information so that he can handle his own hazard avoidance control without ground assistance.

As the size and weight of other Signal Corps radar and radio sets are decreased through continuing programs of miniaturization, airborne navigation, flight and IFF equipment, improved two-way voice communication radio sets, and other equipment will be perfected in weights and sizes appropriate to small Army aircraft.

Coincident with the development of lightweight data processing equipment for commanders of ground combat forces, an automatic airborne flight programmer will ultimately be developed. Such an electronic instrument would allow the movement of a large number of Army aircraft over a single route—the least hazardous and the most expeditious route. It will consist essentially of a programming device, a storage element, a tiny computer, and servo-mechanisms. Here, again, we will be reducing the need for contact with ground-based stations and the amount of transmission traffic in the battle area.

Helicopters Limited

As is well known to both military and civilian users of helicopters, the all-weather capability, although claimed by some groups, is quite limited. Experienced helicopter pilots have some difficulty performing complex operational missions under good flying conditions.

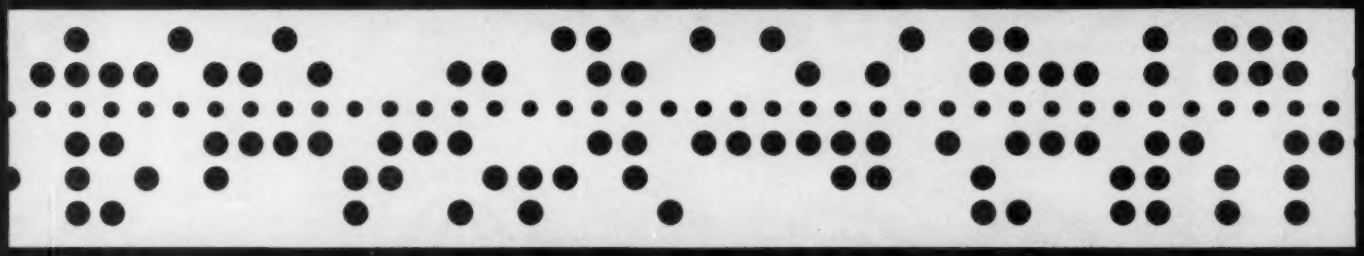
However, on a dark night, or when nature introduces barriers to good visibility, the helicopter operation problems are manifold. Thus, there is a continual search for a true all-visibility capability for the helicopter.

History has shown that anything done to an aircraft to increase its functional capability has resulted in new mission exploitations. The added all-visibility capability promised by the pursuit of various Signal Corps avionics research and development projects will give rise to new missions of value to the Army and the nation.

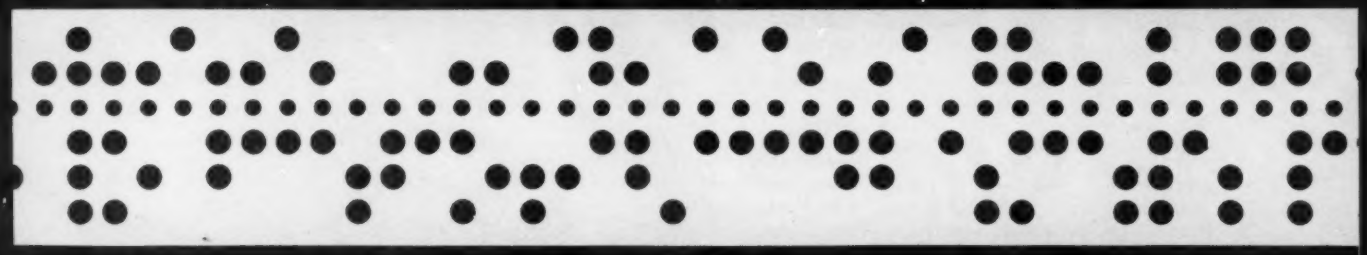
In the interest of national defense, it is essential that scientific advances made in the United States assume a greater rate. The Signal Corps research and development program's aim of making significant advances in the art of avionics is in keeping with this most important requirement.

Plan Future Improvements

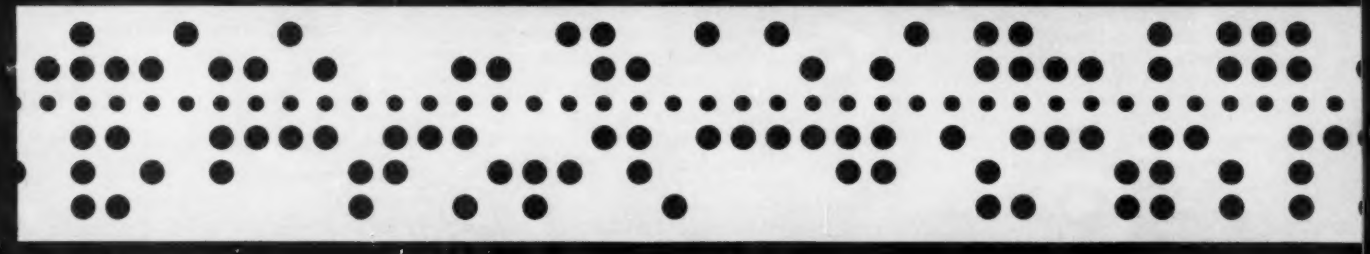
In the future, through the incorporation of advanced cockpit instrumentation concepts and new sensory techniques combined in a single light-weight self-contained system, precise naviga-



Tapewinders · Paperwinders



Word Counters · Circuit Timers



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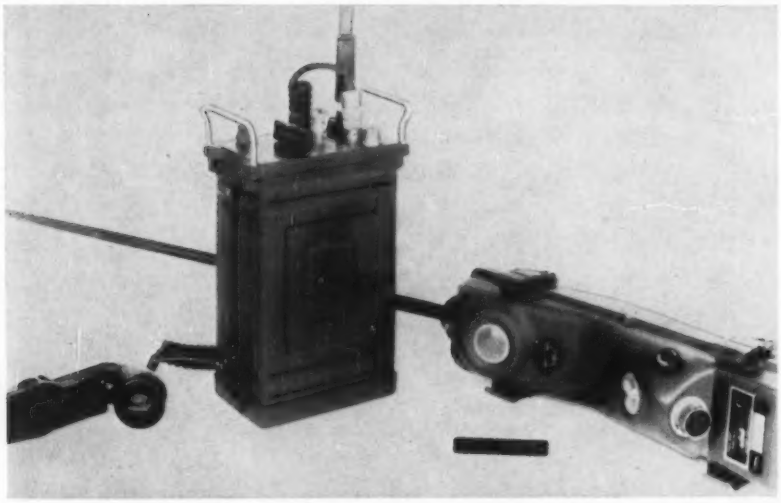


Under development by the U. S. Army Signal Corps are replacements for the present combat-area radio sets, shown on the left. New pouch-type sets—like the one on the right—have an operating range of about a mile with some frequency selection.

tion will be possible without dependence on ground-based radio transmitters. This will give Army aviation the means for freedom of movement essential in meeting mobility requirements of the modern Army.

There are two basic types of communication systems for Army aircraft. These are the tactical system and the operational control system.

The tactical system is directly allied with the communication system of ground combat forces. It must provide secure communications between the aircraft and tactical ground units—for reconnaissance, combat surveillance, artillery fire adjustment, and command control.

The operational control system provides radio contact with ground operational control centers, and with other Army aircraft.

Through avionics, Army aircraft are equipped with radio sets and with navigational, homing, and other electronic instruments. But these combat "birds" also need a place to land and some navigation assistance, again through avionics, to get there and take off again.

One Man Handles Two Planes

At prepared landing fields and strips, ground operational control stations are located. Often no larger than air-transportable steel "huts," these stations are equipped with radio sets and electronic gear, such as beacons, direction finding, GCA equipment, and other devices, for traffic control, IFF, and navigation.

One type of GCA—Ground Controlled Approach—system for Army air fields can handle two planes simultaneously, and is operated by one man—typical of the minimum manpower requirements of Army aviation and avionics.

For landing at unprepared landing strips and in desolate areas, avionics will help the Army pilot by providing radio beacons that he can drop to obtain guidance. But in emergencies, particularly over hostile territory, the Army aviator is pretty much on his own.

A third major element of command control is called combat surveillance. This, like communications and avionics, is a system primarily used in forward or battle areas.

Combat surveillance is an all-weather, day-and-night, systematic search of a battle area primarily to collect information about the enemy, the weather and terrain for our tactical commanders.

Combination of Means Used

Any of a combination of means may be used by the system. It may use radar, infrared, sonic, photographic television or other sensory devices. It may use meteorological equipment. It may use reconnaissance or remote-controlled means of gathering data about friendly or enemy troops and material, the weather, the terrain or other important tactical information. The system also has the electronic means for processing, analyzing and presenting its collected information rapidly and effectively.

For example, radar provides detection and range data—almost independently of weather and darkness. This set, the Silent Sentry, is pulsed Doppler radar, used at lower echelons. It can locate a moving man at 1,500 yards. It also can detect a moving vehicle at 5,000 yards.

The Army Signal Corps has developed an ultra-sensitive frontline radar, the TPS-25, which looks deep into hostile territory and detects the slightest enemy ground movement. The set will spot a rolling tank, truck, or jeep at 10 miles.

Passive Infrared Devices

Passive infrared devices are not vulnerable to detection. They have much less range but higher resolution than radar. They penetrate haze better than photographic cameras and can detect thermal targets through camouflage. Photography and television have the best resolution, but are affected by adverse weather and by darkness.

No single means, then, will fill the bill. In combat, a combination of sensory devices is needed to provide essential tactical information.

Ground-based surveillance, although largely limited in range to the horizon, will also be used as a perimeter defense against infiltration, protection of restricted areas from trespassers, traffic counting, and other applications. Radar, infrared, photography, sonic, and seismic means of detection will be utilized.

To get a higher angular perspective, or to increase the range of a surveillance system, sensory devices are being installed in aerial platforms—such as manned aircraft and pilotless drones.

Of the various types of airborne platforms, the *drone-pilotless*, small in size, and remotely controlled, shows good tactical promise.

Signals Regulate Drone

Signals transmitted from a ground control station to the drone's auto-pilot system will regulate stability, altitude and air speed. Complying with remote commands, the aircraft can maneuver, climb, or glide. Other control provisions prevent stalls, over-speeding, excessive loss of altitude, and other hazardous conditions.

The sensory device carried by the drone can be actuated automatically or by appropriate control signals from the ground station.

When the drone is flying as a passive receiver—say, when taking still photographs—the sensory means will record the data for retention until the drone returns to the ground station.

When equipped to collect transient

(Continued on page 73)

Home of the U. S. Army Signal Supply Agency in Philadelphia.

Through the Years with the U. S. Army Signal Supply Agency

IT IS A fortunate child that has the opportunity to see the achievements of an illustrious parent being acclaimed by the world. We, at the U. S. Army Signal Supply Agency in Philadelphia, Pa., are happily, in this enviable position.

From wig-wag flags to the satellite. From General Myer to General Nelson. Signals — giving man the ability to reach out beyond himself. Communications—linking the peoples of the world —bringing messages from outer space —on the very verge, it seems certain, of affording contact between our world and the other planets in outer space.

Being located in Philadelphia, we have reason to be proud of the city's history. It is the home of the Liberty Bell; it was here that the Declaration of Independence was signed; that the Continental Congress met to draft up the Constitution. And, of course, we are proud to be a part of the Army Signal Corps, which has earned the right to a very special celebration on its 100th birthday, and of the fact that our mission is as old as the Corps itself.

Agency Eight Years Old

This statement may seem strange, in view of the fact that the U. S. Army Signal Supply Agency (USASSA), as one organization, under one commander, counts itself as only eight years old. Our present set-up is the result of the consolidation in 1952 of two agencies—Stock Control Agency and Signal Corps Procurement Agency—both of which came to Philadelphia during World War II, and both of which have been serving the Chief Signal Officer virtually since establishment of the Corps.

The development, procurement, storage and issue of signal equipment have always been primary functions of the Office of the Chief Signal Officer. Even the early "wig-wag" flags were purchased and issued and stored under its direct supervision and jurisdiction including the heliograph, the telephone, the teletype, up to the latest and most highly specialized radio and radar communications, handie-talkies, satellites.

When, during and after the Indian Wars of 1865 to 1890, it was necessary to construct and maintain 5,000 telegraph lines throughout the West and Southwest, it was the Army Signal Corps that bought and handled the equipment. Our function was a vital one during the period of installation of telegraph and cable systems following the Spanish-American War, in the Philippines, Alaska, and other far-away places. The Army Signal Corps purchased and issued equipment for the first radio stations developed and maintained by the Army.

Buying, Storing Important

During the period 1870 to 1890, when the Army Signal Corps organized, established, and developed a weather reporting service and laid the groundwork for our nation's present-day weather bureau, the functions of purchasing and storing were again of paramount importance.

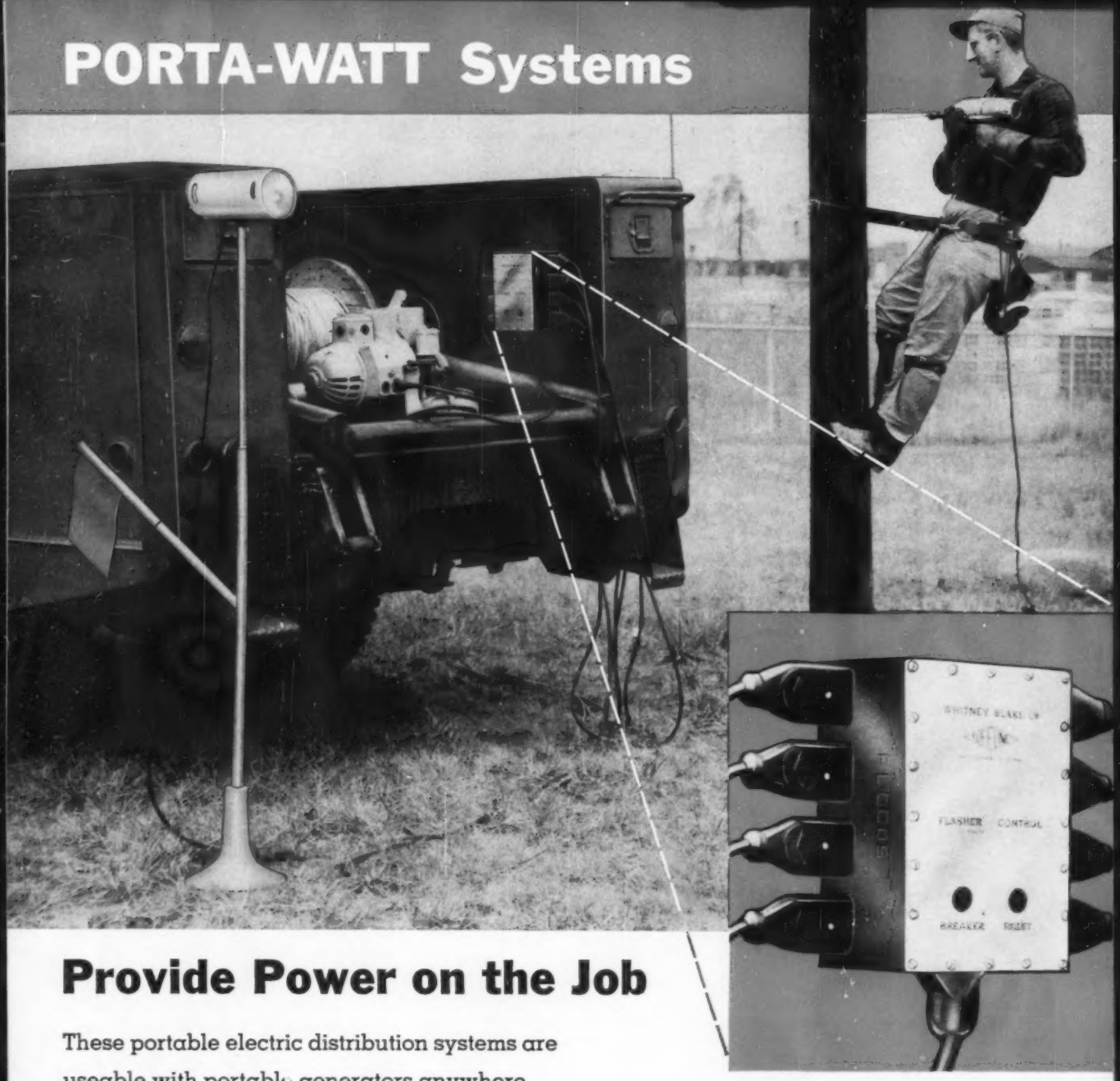
In the early 1900's, the Army Signal Corps organized and established the Army Air Service. In 1907, the War Department issued specifications for construction of the Army's first military plane. It awarded a contract to the Wright Brothers, who had made the first successful airplane flight in 1903. In 1908, the Army Signal Corps purchased the first Army dirigible, and this marked the beginning of the present Department of the Air Force.

In the days before America's entry into World War I in 1917, the activity of storing and issuing of signal supplies was not known by any specific name. Officers, enlisted men and civilians assigned to the work, performed it in addition to other duties. There were approximately 2,500 different items of signal equipment available for issue, and these were stored in depots in New York, Chicago, San Francisco, and San Antonio.

Then came World War I. Peace-loving, America was catapulted into the conflict. Miraculously, the office charged

(Continued on page 74)

PORTA-WATT Systems



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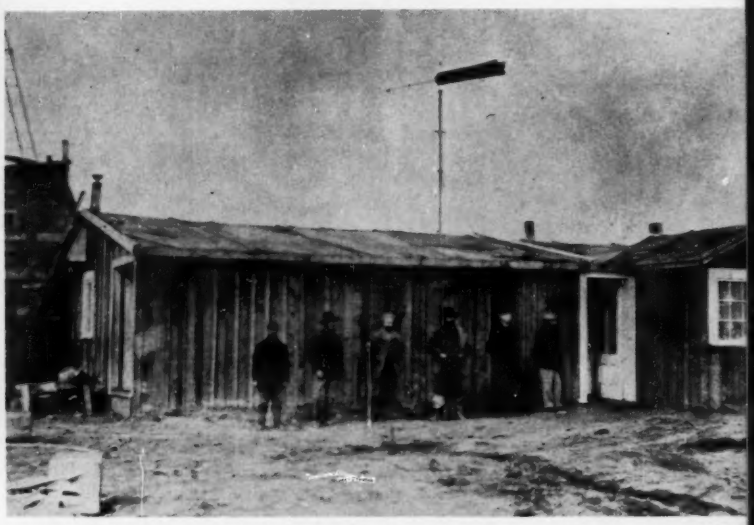
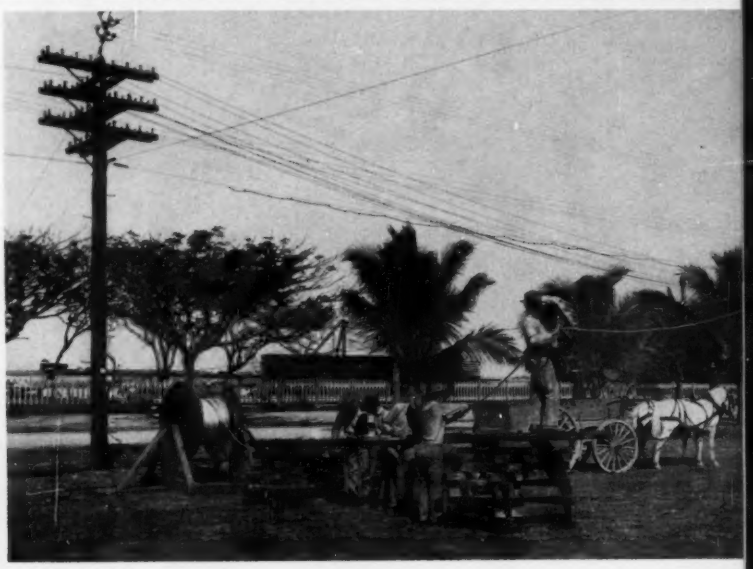
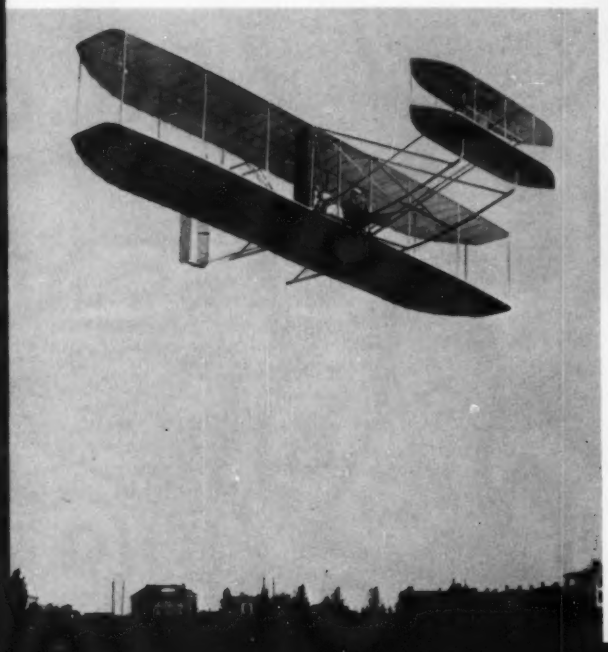
LEFT: Elk military signal station, typical of Civil War fixed signal installations along the Potomac and throughout the vast battle area.



ABOVE RIGHT: U. S. Army Signal station, main building, front view, of the Point Barrow Expedition, 1881-1883.

RIGHT: Cable work on Malecon Drive, in Manila, Philippine Islands, in 1902, after Spanish-American War, when the U. S. Army Signal Corps brought modern communications to the former Spanish territory.





LEFT: Orville Wright in his famous plane, making test flight for U. S. Army Signal Corps, in September 1909, demonstrating military capabilities of aircraft.

ABOVE: Capt. William Mitchell, Army Signal Corps, in Alaska, during period when Alaska communications were being set up by Signal Corps. Captain (later Major General) Mitchell served with the Army Signal Corps since early in the century. He later was transferred to the aeronautics division of the Army Signal Corps. The division later became the U. S. Army Air Corps.

TOP ABOVE: Preparing pigeons to carry dispatches back from front lines at St. Pol, France, in World War I. Pigeons were for many years a key factor in U. S. Army Military communications, but were replaced by high-speed mechanical equipment.

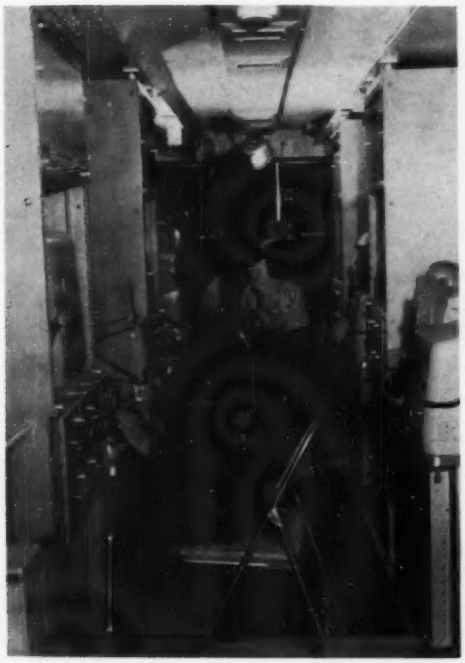
NEXT ABOVE: U. S. Army Signal Corps combat soldier uses "Lucas" lamp in World War I. This lamp replaced the heliograph used in previous wars as means of visual signalling both day and night.

LEFT ABOVE: Working in snow, this World War II soldier traces a broken field wire line for splicing.

LEFT BELOW: Photography, both combat and technical, is an important Army Signal Corps mission. Here Army Pictorial Service photographer calmly takes pictures of amphibious truck, the famous "Dukw" or "duck," set afire by German shells during World War II in the Nettuno, Italy, beachhead.

Infantry troops in Korea keep sharp lookout for movement in Communist-held area as U.N. troops bombard with white phosphorous shells. Dual role of Army Signal Corps is illustrated by Signal Corps-developed front-line communications equipment and photographed in front-line action by Signal Corps combat photographer.

Using the U. S. Army Signal Corps' new combat radio-telephone system mounted in a Jeep, a soldier can ring a distant switchboard operator and be connected directly to another Jeep miles away. This experimental system allows on-the-move telephone service for scouting missions and front-line communications.



ABOVE: Army air-ground transportable radio communications system, AN/TSC-16, is geared to quick-reaction demands of small wars and brush-fire combat operations.

RIGHT ABOVE: Artillery officer monitors action from defense commander's tactical console at modern Missile Master installation at Fort George G. Meade, Maryland. The commander coordinates related activities of antiaircraft operation center with other centers and the Air Force.

RIGHT BELOW: Serving as reconnaissance eyes and ears are U. S. Army Signal Corps' new eight-pound tactical television camera and handy walkie-talkie radio.

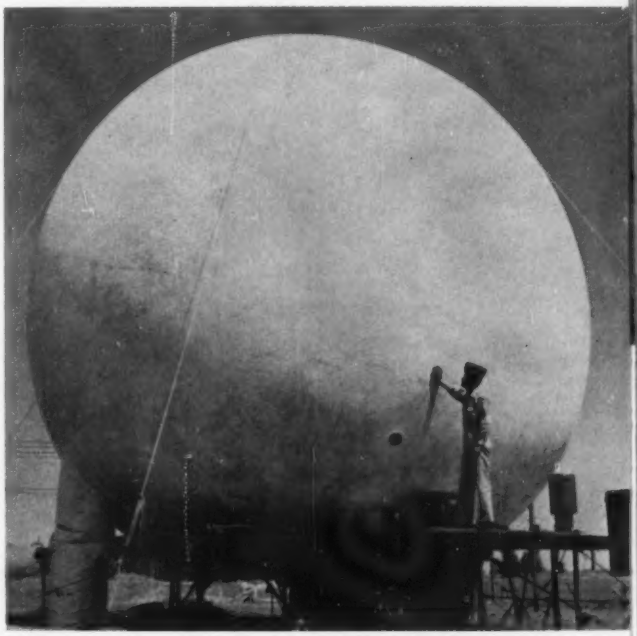
ABOVE: Another modern-day U. S. Army Signal Corps innovation is the TV robot plane which can be controlled by remote radio controls up to 40 miles away. The unmanned craft sends back aerial views of distant sites. Airborne TV station weighs only 135 pounds.

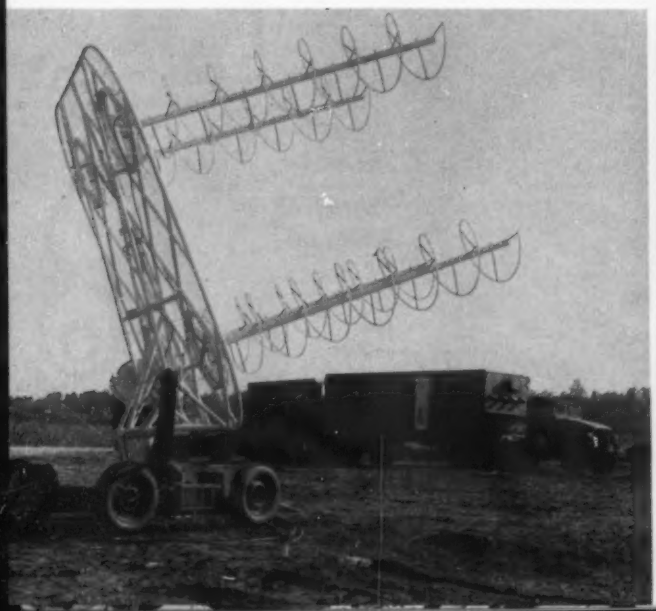
RIGHT ABOVE: In action at historic Fort Huachuca is the Army Signal Corps' new compact all-weather radar eye, AN/PPS-4 radar set, which can spot a single enemy moving a half-mile away in darkness or fog, and vehicles or large forces of enemy infantry much farther away.

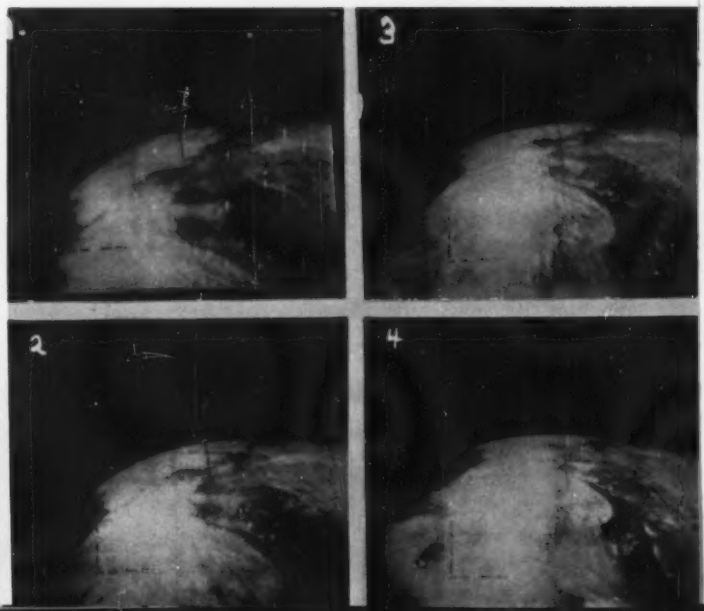
RIGHT: Plastic balloon, resting on a mobile trailer bed, forms housing for antenna of Frescanar, revolutionary present-day electronic-beam radar system. The antenna, operated from within the inflated balloon, is protected from snow, ice, and wind.

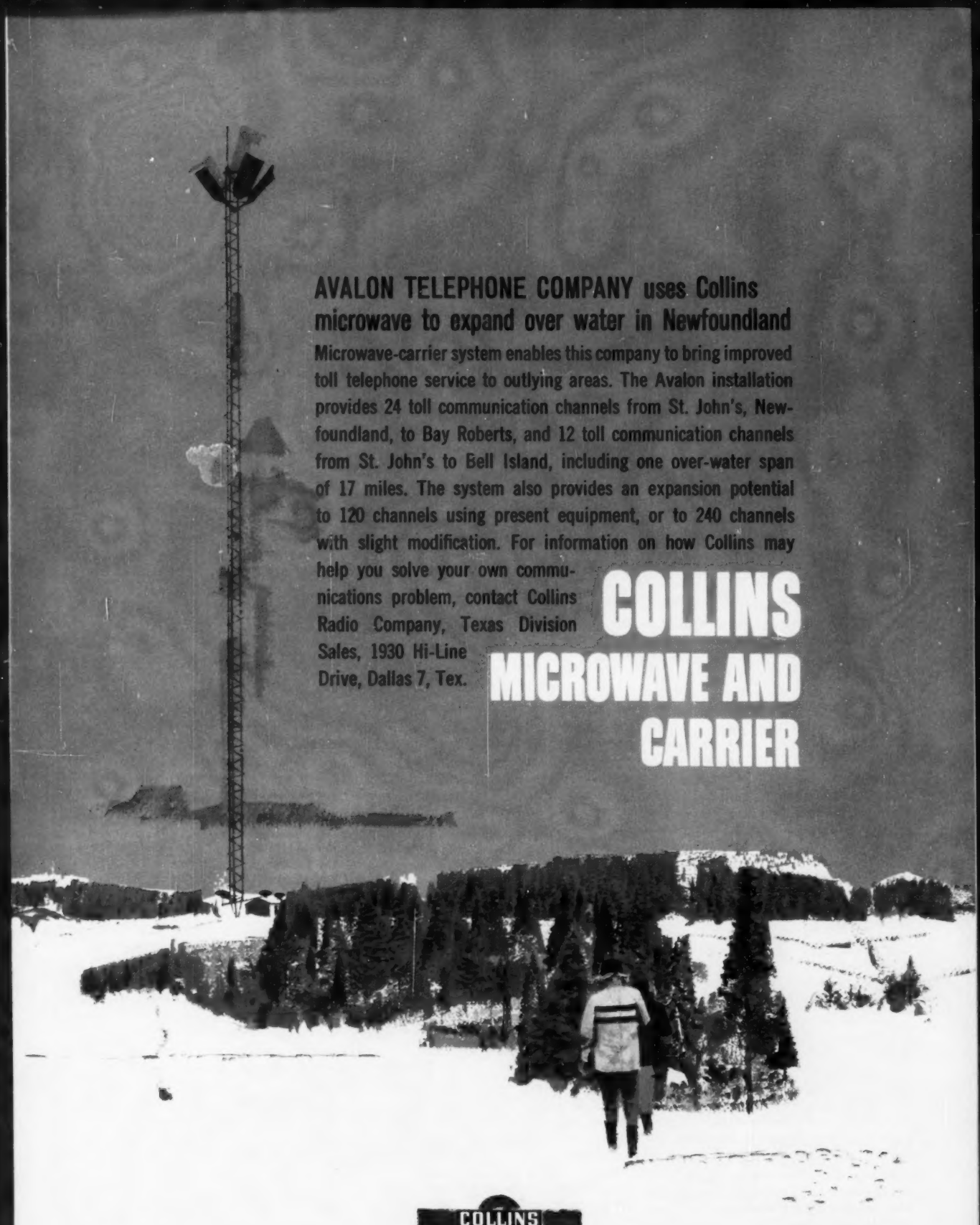
LEFT BELOW: Messages may be transmitted to and received from satellites, through use of intricate antenna at left and other electronic equipment located in the mobile vans of the U. S. Army Signal Corps.

RIGHT BELOW: Sequence photographs taken by TIROS I, from 450 miles in space. Photos were sent from satellite by TV to receivers of the Army Signal Corps at Fort Monmouth. White area shows northeastern United States and Canada. Dark area at the bottom right is the Gulf of St. Lawrence.









AVALON TELEPHONE COMPANY uses Collins microwave to expand over water in Newfoundland

Microwave-carrier system enables this company to bring improved toll telephone service to outlying areas. The Avalon installation provides 24 toll communication channels from St. John's, Newfoundland, to Bay Roberts, and 12 toll communication channels from St. John's to Bell Island, including one over-water span of 17 miles. The system also provides an expansion potential to 120 channels using present equipment, or to 240 channels with slight modification. For information on how Collins may help you solve your own communications problem, contact Collins Radio Company, Texas Division Sales, 1930 Hi-Line Drive, Dallas 7, Tex.

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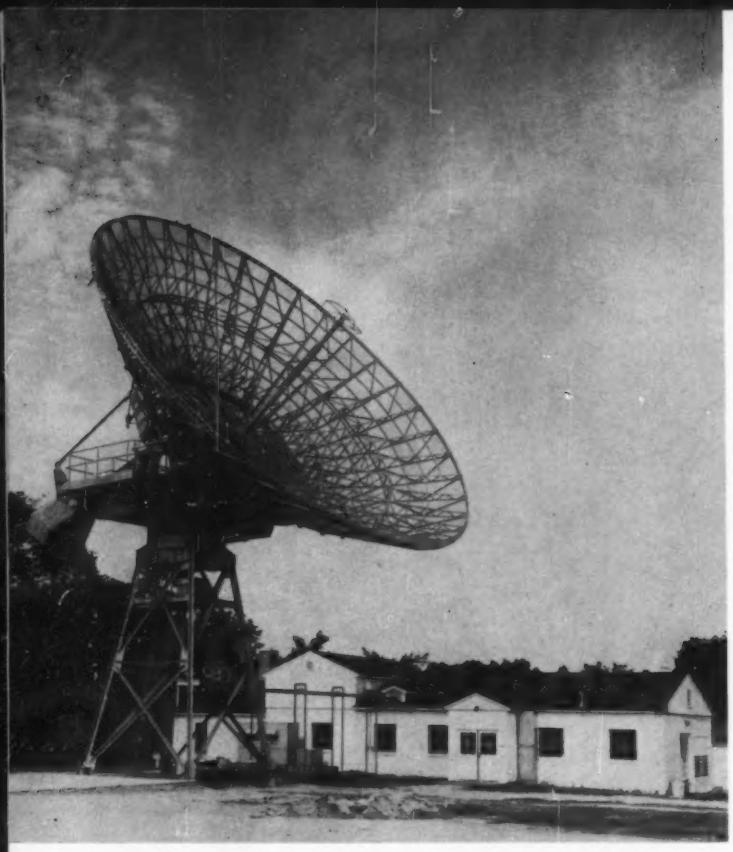


Diana dish radar in the Evans Area, Fort Monmouth, similar to one which bounced signal off moon in 1946.

FORT MONMOUTH

Research and Development Center

FROM A HUMBLE beginning back in June, 1917, when a meagre, nameless, war-time camp was established at Little Silver, N. J., with less than 500 officers and men, Fort Monmouth, 43 years old this month, has become the world's largest Army Signal Corps Center for military communications research, development and training.

The evolution spans from the small tent camp of 1917 with its handful of men, and its early radio studies, to a vast space age installation, that is today's Fort Monmouth, with thousands of officers and men, and annual civilian payroll in the millions.

Missions of the Army Signal School and the Army Signal Research and Development Laboratories have tripled and multiplied to meet the demands of modern-day defense. Fort Monmouth scientists and engineers have made some major contributions to the solutions of these complex problems, including many in the field of space.

Among these was the development of the instrumentation that made it possible for President Eisenhower to broadcast his historic good-will message from outer space; the development of the solar cell conversion for powering satellite radios; a more complex solar ring for EXPLORER VII, and the instrumentation for the VANGUARD II "cloud cover" satellite and the TIROS satellite.

Tying in with the coming of the space age and its increasing number of orbiting satellites, the laboratory's Astro Observation Center has come into national prominence through round-the-clock tracking of each new space vehicle in orbit.

The first convoy of trucks loaded with equipment and military personnel arrived at the campsite that was to become the modern Fort Monmouth on June 4, 1917. The site was the old and abandoned Monmouth Park Race Track of the Gay Nineties. The trip from New York was made in Model-T Fords and Selden Sixes.

The next day another detachment arrived to survey the land and stake the boundaries. Quartermaster equipment followed in horse-drawn wagons. Soon construction was started on semi-permanent buildings for post headquarters, an officer's quarters, a barracks and a food warehouse.

The new camp later accepted troops for specialized instruction in telephone, telegraph, radio, heliograph and semaphore communications; also cryptography and basic military subjects. The first troops to arrive were assigned to the First and Second Reserve Telegraph Battalions.

Although the new establishment had no official name for the first three months, it was variously known as Camp Monmouth Park and Camp Little Silver. In September 1917, it was officially named Camp Alfred Vail in honor of Alfred Vail of Morristown, N. J., who had been the partner and financial backer of Samuel F. B. Morse of electro-magnetic telegraph fame.

In 1925, Camp Vail was made a permanent installation and renamed Fort Monmouth in memory of the heroes who gave their lives in the historic Revolutionary Battle of Monmouth.

The impressive establishment that is now the U. S. Army Signal School, is an index of the ever-increasing importance of scientific military training to the survival and progress of the nation.

Officers and enlisted men are trained in communications, electronics, photography and associated military subjects to meet the demands of the modern, combat-ready army. The school also conducts an extension course program to keep the thousands of active duty

and reserve personnel abreast of the latest Signal Corps trends and doctrine.

Throughout World War II, a total of 432,000 officers and men were trained under Signal Corps supervision at various installations. Thirty-four thousand officers graduated from 50 different courses. More than 20,000 of these received training at Fort Monmouth.

The mission of the Signal Research and Development Laboratory is to conduct and direct continuing research in all fields of physical science leading to the development of new techniques, and the design and improvement of communications, radar, electronic countermeasures, electronic data processing, radiological, meteorological, photographic, drones, and other surveillance equipments.

Also, related components, and special electronic and solid state devices for the U. S. Army (and for other U. S. Governmental agencies when so authorized), and within established national policy, equipment, material and systems for communications security; to provide consulting service to the Chief Signal Officer in these technical fields, and to plan programs in these areas.

The work of the laboratory's team of scientists, engineers and technicians has blazed the way for many advances in communications.

Development of the world's first radio relay satellite and other Signal Corps contributions to space exploration are significant. They dramatize the advanced work being accomplished across the broad band of military communications, surveillance and development of electronic components.

Equipment to meet unprecedented requirements are being developed for the Pentomic Army of today and the future; a highly mobile, widely dispersed force tied together by communications of the highest capability and reliability.

Size and weight reduction, better power sources, more complex function and economy of manufacture are among the equipment requirements for soldiers and commanders in the field as well as for exploration of outer space.

Teletypewriters, now sending 750 words a minute, instead of 60, are getting still faster. "Electronic Brains" to store, analyze, decipher, reduce and index a growing stream of data are becoming more sophisticated. A host of inverse electronic component parts are being developed or improved for new uses.

Instrumentation for this 20-inch VANGUARD II satellite was designed at U. S. Army Signal Research and Development Laboratory to scan earth's constantly changing cloud patterns.

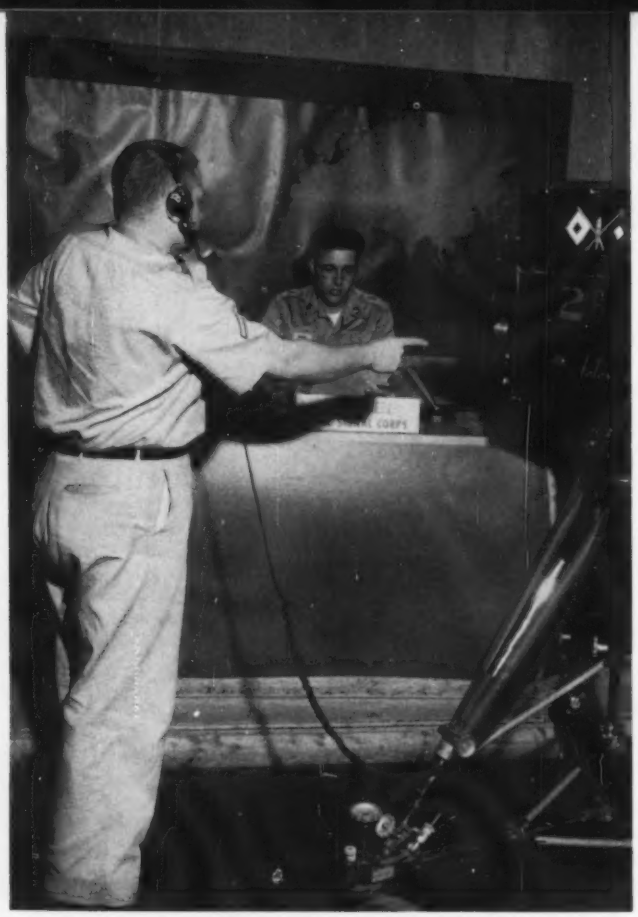
"We have witnessed the advent of the Space Age with its large impact on national defense, and the world as a whole," Col. Harold McD. Brown, laboratory commander, observed. "At the same time, over-all technical progress has added further to a revolution in our concepts of military tactics and strategy. There is hardly a single area of science without some bearing on electronics. It, therefore, seems highly likely that the mission of the U. S. Army Signal Research and Development Laboratory will become even more important in the future."

To carry out its mission as a major research and development establishment the Signal Laboratory staff is made up of some 475 military personnel, and 2,850 civilian employes. The headquarters, and center of activities, is the as yet uncompleted Hexagon Building, a sharp "now-and-then" contrast over the few wooden buildings that housed the "labs" in Fort Monmouth pioneer days.

On any given day, Signal Laboratory personnel may be studying some special aspect of radio communications in the Antarctic, atmospheric electricity in the Arctic, or high-altitude winds along the Equator. Always, of course, advanced aids are being studied, worked on and developed for space exploration of the future.

Current commanding general of Fort Monmouth is Maj. Gen. William D. Hamlin. The commandant of the Army Signal School is Brig. Gen. Charles M. Baer. Col. Harold McD. Brown is commanding officer of the U. S. Army Signal Research and Development Laboratory.

World's fastest general purpose message printer with speed of 3,000 words a minute, a U. S. Army Signal Research and Development Laboratory supervised development.



Men of the television studios of the Southeastern Signal School carry out a five-minute newscast over SESCS closed-circuit TV.

FORT GORDON

U. S. Army Training Center

A FEW YEARS after the end of World War II, a small group of men were sent to Fort Gordon, Ga., to establish the United States Army Signal Training Center.

From its meager beginnings on Oct. 1, 1948, the Signal Training Center soon became the leader in the training of signal soldiers. The largest installation of its kind devoted exclusively to the training of soldiers in the installation, operation and maintenance of modern Signal Corps communications, it has almost 600,000 square feet of academic, classroom and laboratory space available for that purpose.

Originally intended to support the Signal School at Fort Monmouth, N. J., the STC was forced to undergo terrific expansion to meet the suddenly increased demands for signalmen for the Korean conflict.

The Signal Corps Replacement Training Center was activated in October, 1950, to meet the war needs, and more than 50,000 basic trainees were graduated and sent on their way to the battlefield.

The seven years since peace was established are a success story of achievement for the Army's Signal Training Center. More than 150,000 men entered the halls of school buildings as basic soldiers and left as Signal Corps specialists.

Nestled in the rolling hills of central Georgia, the STC has also added much to the progress and culture of its growing neighbor city, Augusta. Soldiers from the center take part in local theatrical productions, symphonic presentations and church functions. Also, much of Augusta's night life is supplemented by jazz musicians stationed at Ft. Gordon.

Upon entering the fort, a scenic, curving drive leads to the area of the Signal Training Center. The first important part of the STC to attract attention is the Southeastern Signal School.

One of the nation's outstanding communications-electronics schools, the Southeastern Signal School, was activated on Oct. 25, 1948.

Besides training U. S. Army signalmen, SESCS also opens its academic doors to members of the Air Force, Navy, Marines and Women's Army Corps. In addition, personnel from many allied countries receive training here. The school is a "Melting-Pot of Signal Education." It is not unusual for soldiers, sailors, marines and WACs to sit in on a seminar with signalmen from Korea, France, or the Netherlands.

Courses taught at the school include Communication Specialization, Electronic Instrument Repair, Electronic Navigation Repair, Field Radio Repair, Radio Teletype Operations, Signal Supply and Parts Specialization, and Cable Splicing. Others are Central Office Supervision, Field Carrier Equipment Repair, Manual Central Office repair, Power Equipment Maintenance and Teletypewriter Equipment Repair.

The Southeastern Signal School annually graduates as many or more advanced individual trainees than any other school in the Army, and has become the largest single activity of its type in the country. The growth of the school reflects the increasing importance of electronics as a key factor in national defense.

Continuing on the road through the Army's Signal Training Center, the second sub-command to be established at Fort Gordon is reached. But, unlike the others, the Signal Unit Training Group's area of training is not concentrated in one general area, but is spread over hundreds of acres.

Currently taking giant steps in military communications training, the SUTG takes the soldier after he completes advanced individual training and places him in a battle-ready unit or team.

In addition to training, practical use of their skills is an important part of the duties of a group signalman. During many exercises and operations, it is up to the field units of the SUTG to provide all of the complex communications necessary in actual war.

A part of the Strategic Army Corps, battle-ready outfits throughout the world, the men of SUTG are ready to

take their place on the front line of battle as soon as the call is sounded.

Back from the field and into the concentrated general training area, thousands of soldiers can be seen doing physical training, cleaning barracks buildings; this is the "home" of the students from the Southeastern Signal School—the Signal Training Regiment.

The regiment is responsible for the housing, feeding and military training of the thousands of students that arrive at the Signal Center for specialized training. In short, it must see that students are ready for the vital aspect of military life best summed up in the word "soldiering."

The tour of the center leads past a field that looks like the top side of a porcupine with many needles sticking out, but in this case it is hundreds of telephone poles. It is called the "Pole Orchard," where men are taught the techniques of pole-climbing and the maintenance of telephone wires.

This is just one of the activities of the newest member of the Army's Signal Training family, the Signal Advanced Individual Training Group.

Capable of handling a training load of more than 3,000 students, SAITG, within a period of eight weeks, develops specialists in Radio Relay and Carrier Operations, Telephone Installation and Repair, Communications Center Operations, Teletype Operations and Central Office Telephone Switchboard Operations.

The pole-climbing course has its own particular lore. The greatest bloc that must be overcome before becoming an expert climber is the fear of high places, and having confidence in oneself. To reach this goal, a game was created where men on poles many feet above the ground play catch with a basketball. This takes their minds off becoming tense and relaxes their bodies at the same time.

Many stories are told about the local chaplain who was faced with the problem of reassuring many pole-climbers who brought their problems to him. In order to gain an insight into their way of thinking and feeling, he put on spiked-boots and climbed to the top of the highest pole, talking to students surrounding him on this high perch, and thereby gained their confidence and respect.

Another sight which may be visited at the Signal Training Center is the TV studios, which went into operation in November, 1952. The studios are among the best equipped in the Army and have become one of the most essential of the school's training tools. They operate on a regular daily schedule and many subjects are taught through this medium.

Movie men from Army Pictorial Center, Long Island City, N.Y., shoot footage for training film on pole line construction at lineman's course, Fort Gordon.

A final stopping place on the tour through the training land of signal soldiers could be the office of the commanding general, Brig. Gen. Benjamin H. Pochyla. He was employed by Southwestern Bell Telephone Co. as an industrial engineer and was a cavalry reserve officer prior to World War II.

The new "Dean" of the "communications-electronics college" is a firm believer in the future of the Signal Training Center. He believes that the center must, and will, keep in stride with the pace of progress set by the country, and the U. S. Army Signal Corps, in this its 100th year.

Signal Corps Landings In France

The first U. S. Army Signal Corps troops to land in the great D-Day invasion of Normandy on June 6, 1944, were 28 men of the 101st Airborne Signal Company. They parachuted with the division headquarters group and landed near Hiesville.

First Signal Corps troops to come ashore afoot in France were personnel of the 294th Joint Assault Signal Company at Omaha Beach. Within a few minutes personnel of the 286th Joint Assault Signal Company landed at Utah Beach.

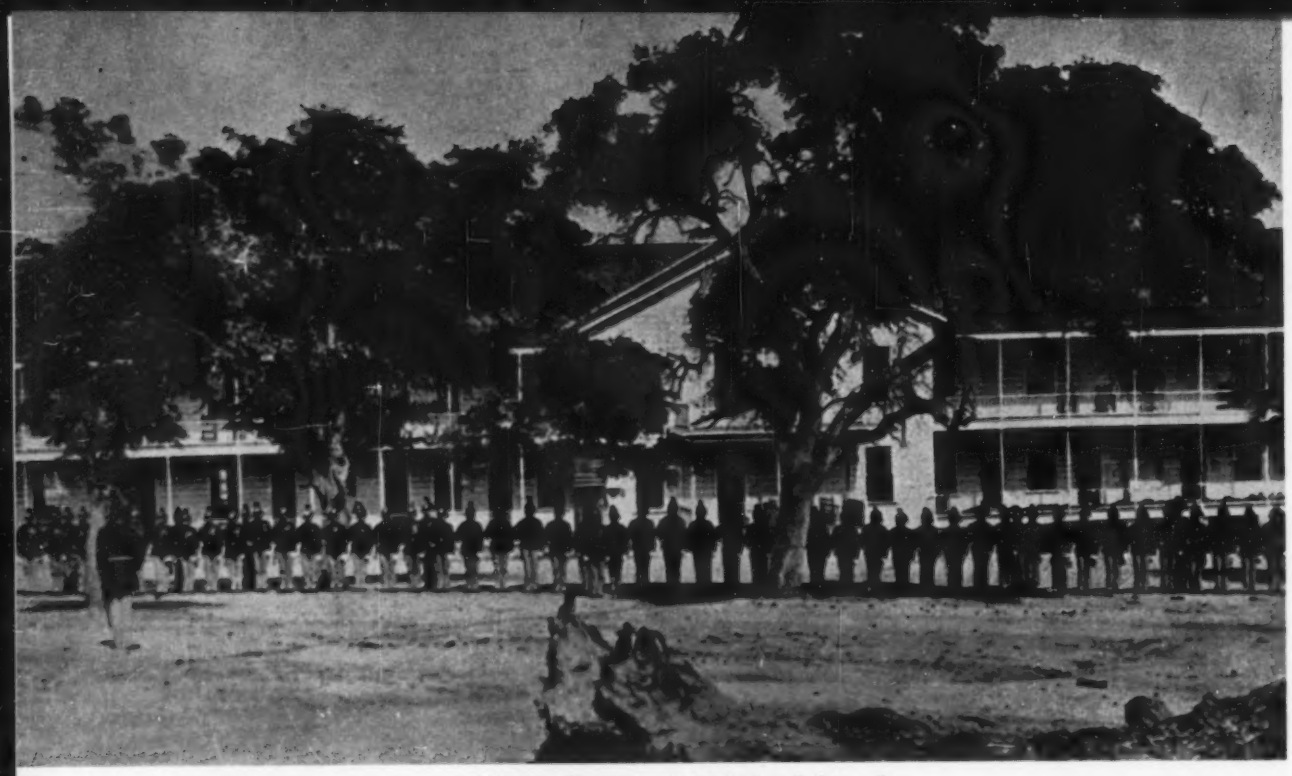
The 165th Signal Photographic Company landed with the first infantry elements at Omaha Beach. The commanding officer Captain Herman Wall, was the first Army Signal Corps casualty of the Normandy invasion. His pictures were the first photographs of the invasion to reach England and be reproduced.

First Telephone Experiment

Less than two years after Bell's invention of the telephone, the Army Signal Corps in October 1877 experimented with it successfully over an existing 10-mile field telegraph line at Fort Whipple, Va. (later Ft. Myer). In the spring of 1878, a 40-mile telephone line was constructed of two iron wires.

Field Telephone

A combination of the Bell telephone and a telegraph instrument, the first military field telephone kit, was developed in June 1889 by the Army Signal Corps.



Old Fort Huachuca, in its Indian fighting days.

FORT HUACHUCA

U. S. Army Electronic Proving Ground

A NATIONWIDE search by the Army Signal Corps for a testing area relatively free of electromagnetic interference ended in February 1954, and historic Fort Huachuca became the U. S. Army Electronic Proving Ground.

Here, in an isolated spot in southeastern Arizona, was the proper environment for field tests of the complex electronic gadgetry which has become part and parcel of the modern Army. Here was plenty of space, both on the ground and in the air, with the old Cavalry post's area covering 74 thousand acres of the wide open spaces in fabled Cochise County.

Now commanding general of sprawling Fort Huachuca and its maze of Signal Corps testing facilities, is Maj. Gen. Francis F. Uhrhane, who took over command of the post on last Feb. 28. He came to the Arizona Proving Ground from Colorado Springs, where he had served as Deputy Chief of Staff for Communications and Electronics of the North American Air Defense Command. A scientist, as well as a tactician, the USAEPG commanding general holds a Master of Science degree in Electrical Engineering from Ohio State University.

Prior to the opening of its new proving ground, the Signal Corps had been testing electronic equipment at its Fort Monmouth, N. J., Laboratories. Before the end of 1954, two major activities—The Electronic Warfare Center and the Signal Corps Aviation Center—were moved, with equipment and personnel, to the atmospheric freedom of the southwest.

Today, many new activities have been added to the original two, and the Proving Ground now carries out its mission and purpose under four directorates: Logistics, Personnel and Administration, Orientation and Training, and Combat Developments. Under the latter, the organizational structure includes three divisions and five technical departments, which plan, execute and evaluate exhaustive tests on the Army's electronic devices and systems.

The newest of the three divisions is Electromagnetic Environmental Test which is concerned with the project for which Pan American World Airways, Inc. recently was awarded an 18.8 million dollar contract. EETD, Pan American and Bell Aircraft, principal subcontractor, will conduct tests on the big problem of electromagnetic interference with the operation of Army combat electronic equipment. A second part of the project covers acquisition of data in support of surveillance drone testing. The other divisions in CDev are Plans and Systems.

The largest of the five technical departments is Combat Surveillance and Avionics. Its two-fold responsibility is the evaluation of surveillance equipments to provide 'round-the-clock, all weather intelligence, and field testing communications and electronics systems for Army aviation use. Among the items presently included in its testing programs are: Detonation Locator Central System, ground and airborne radars, airborne television and photo transmission systems, and the SD-2 Surveillance Drone System. In the tests of the Detonation Locator Central System, nine mobile stations have been set up in "triplets" near Prescott, Ariz., and the California cities of San Luis Obispo and San Diego.

The Signal Communications Department is testing "mass communication" equipment which is designed to enable all units on all levels of command to

"keep in touch." One of its major projects is the automatic electronic switchboard, which will reduce the size and increase the mobility of field communication equipment while doing its job in microseconds. Other SigCom projects include: a radio central which will have the capability of handling multiple conversations between field units simultaneously, laying of field wire and cable by helicopter, and tropospheric scatter, one of its most dramatic testing projects. In this system, huge inflatable antennae are used to bounce signals "off the sky" all but eliminating geographical barriers to field communications.

Defensive weapons, or counter-measures and counter counter-measures, fall within the province of the Electronic Warfare Department. Although much of its work, and the equipment it is testing, are classified, this much can be said: It is evaluating devices designed to destroy the enemy's command control capabilities and, at the same time, improve the Army's own defense against this type of attack.

Testing and evaluating field-type computers, to handle the great volume of data furnished by new surveillance and communications devices, is the main mission of the Automatic Data Processing Department. In one of its most notable testing programs to date, ADP is checking out improved prototypes of MOBIDIC (Mobile Digital Computer). However, this is only one part of the department's work. Studies made at other installations are forwarded to Fort Huachuca for analysis in one of the Army's largest computing centers which includes an IBM 709 as its nucleus. This work is done in support of Department of the Army and Continental Army Command studies in applying automatic data processing to tactical uses.

With complex military electronic devices and systems becoming more intricate and, thus, more sensitive to atmospherical conditions, precise information about these conditions has become increasingly important to the Army. Equipment to provide this information quickly, and in accurate detail, is being tested at the Proving Ground by the Meteorology Department. However, the department's work is not confined to the high and dry climatal conditions of Arizona. Teams from Fort Huachuca are now participating in research programs being conducted by the Signal Corps and other agencies throughout the northern half of the Western Hemisphere.

Meanwhile, the field of micrometeorology has become one of intense study at USAEPG. Work in this area includes evaluation of instruments which will give field commanders of the future detailed data on conditions in limited areas of enemy territory. One of the recent meteorological advances at Fort Huachuca is the development of a thermocouple for temperature measurement. This small, but important, item will come close to eliminating the heat radiation factor which for many years has plagued meteorologists in their efforts to get completely accurate temperature readings.

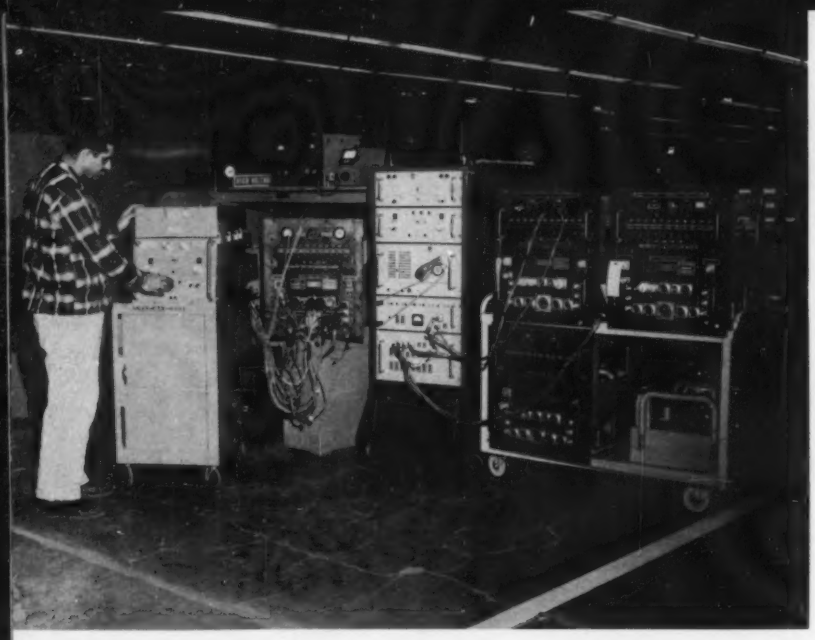
Laying spiral-4 cable by air. One mile of cable was laid in 70 seconds, using four dispensers sling-mounted on a No. 34 helicopter.

The center around which activity revolves at the Proving Ground is the Technical Building, officially known as Greely Hall, named in honor of the illustrious Brig. Gen. Adolphus W. Greely, the Army's Chief Signal Officer from 1887 to 1906. Although this structure has an austere outside appearance, inside it houses some of the most up-to-date scientific equipment in the Army's stock of electronic gear.

The long and colorful history of Fort Huachuca began in March 1877 with the arrival of Capt. Samuel M. Whitside and two troops of the U. S. Cavalry. These rough-riding units of the Sixth Cavalry had been dispatched from Whipple Barracks, near Prescott, with orders to put an end to the destructive raids of the Apaches. Captain Whitside picked a spot at the mouth of the

(Continued on page 76)

Aerial view of U.S. Army Electronic Proving Ground, showing only a part of the 74,000 acres which the Army Signal Corps installation covers.



A supertester in use at Sacramento Signal Depot which performs in minutes scores of tests that would manually take several hours.

SIGNAL DEPOT

Maintenance, Mission and Facilities

ACHIEVING and maintaining a position of combat readiness, and preparations which will assure retention of a strong combat capability throughout the course of a possible limited or general war, is the tortuous and difficult mission of our Armed Forces today.

In this uncertain and troubled world, maintenance of a valid combat readiness position so essential to an adequate national defense is a never-ending job. It is axiomatic that ground forces, to win on any battlefield, must have means to move, shoot, and to communicate more effectively than their opposing forces. In the quintessential chain of progressive efforts that must be made to provide these means to the men who use them—research, development, testing, production, and maintenance—the mission of maintenance assumes an importance equal to any of these. Any malfunctioning or dead-lined equipment, on which our fighting men are vitally dependent, may dangerously negate the entire effort.

Five Depots

To assure the continued usability of communications equipment and devices for command control to our using forces, the U. S. Army Signal Corps provides diverse and extensive facilities within the Continental United States to perform the functions of Fifth echelon maintenance on signal equipment.

These facilities are located at the Fort Worth General Depot, Fort Worth, Tex., and in four branch depots at Decatur, Ill.; Lexington, Ky.; Tobyhanna, Pa., and Sacramento, Cal.

The mission of a Depot Maintenance Division is to:

(1) Perform general over-haul of signal equipment for return to stock. (This includes application of all authorized modifications.)
(2) Accomplish crash repairs on due out equipment.
(3) Perform special fabrications.
(4) Provide technical support to field maintenance activities at all echelons and also to other depot elements.
(5) Accomplish other specialized activities, as directed by the Office of the Chief Signal Officer.

Must Expand in Emergency

An important objective of such an organization is the maintenance of a broad in-house production capability. This also creates the additional dividend of providing a hot mobilization base from which to quickly expand in event of national emergency. In fact, the several Maintenance Divisions process, from time to time, selected items of shop equipment which are then placed in a depot equipment reserve category in case of just such an emergency. This equipment is first completely rehabilitated by the Maintenance Division, then packaged for long-time storage to provide an important and necessary supply back-up in the event of any emergency.

Typical organizational segments available within a Maintenance Division include Engineering, Quality Control, and Production Branches, employing over 71 different major job categories. This tremendous variety of skills, coupled with complete facilities, provide economical, quality service in response to immediate customer needs.

Wide Variety of Services

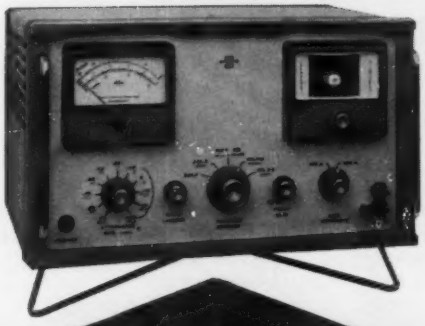
A typical Signal Depot Maintenance Division provides a wide variety of services. At Tobyhanna, where such a division became operational in October 1954, more than 240,000 square feet of productive area is designed for quick capability in meeting any of the Army's electronic maintenance or fabrication requirements. The layout for this incorporates many of the most modern industrial plant innovations.

At Sacramento Signal Depot, the activities of the Maintenance Division are carried out in a building specially designed for that purpose. Becoming operational in this building in 1951, a total of 155,000 square feet is available for test and repair operations and for processing a wide variety of tactical and fixed plant electronic equipments. The shops at Sacramento are so laid out as to be easily and quickly convertible into full assembly line operation if volume production is needed.

All equipment to be processed is brought into a centrally located disassembly area, the equipment is disassembled in accordance with the IROAN concept (i.e., Inspect Repair Only As Necessary), engineered time standards assigned, and then the equipment is quickly routed to the appropriate work areas for processing. Here again, the shops are laid out so that incoming material moves smoothly to the work areas with a minimum of handling. This assures efficient use of plant space and at the same time permits the economical overhaul of all types of electronic equipment, ranging in size from small transistorized sets to very large mobile radar and communication vans.

(Continued on page 50)

New performance
New design
New appearance



TUNABLE, dual selectivity
plus
Flat VTVM feature

Sierra Model 125A

FREQUENCY SELECTIVE VOLTMETER

Model 125A is an all-new vacuum tube voltmeter incorporating features of several previous Sierra instruments in one compact, high-performance instrument.

Covering the frequency range of 3 to 600 KC, this new voltmeter has both narrow and wide selectivity settings plus a flat voltmeter position. This triple mode measurement capability makes the Model 125A an extremely versatile instrument for carrier measurements, wave analysis and general laboratory use. Brief specifications are listed at the side. For full information and demonstration, call your Sierra representative or write direct.

SPECIFICATIONS

Frequency Range
Tunable Mode: 3 KC — 600 KC
Flat Mode: 1 KC — 600 KC

Measurement Range
Tunable Mode: –90 dbm to + 32 dbm
Flat Mode: –30 dbm to + 32 dbm

Selectivity
Narrow: down 3 db 125 cps off resonance
down 45 db 500 cps off resonance
Wide: down 3 db 1.25 KC off resonance
down 45 db 5 KC off resonance

Construction
Modular with etched glass epoxy circuit boards

Data subject to change without notice

sierra

SIERRA ELECTRONIC CORPORATION

A Division of Philco Corporation

6307T BOHANNON DRIVE • DAvenport 6-2060 • MENLO PARK, CALIFORNIA, U.S.A.

Sales representatives in all principal areas
Canada: Atlas Instrument Corporation, Ltd., Montreal, Ottawa, Toronto, Vancouver
Export: Frazar & Hansen, Ltd., San Francisco, Los Angeles

6308

Enviable Safety Record

This shop layout also contributes to an enviable safety record. Only last March, Sacramento's Maintenance Division was presented the coveted Commander's Safety Award for having worked one million manhours without sustaining a disabling injury.

A comprehensive and simplified tagging system is used to facilitate production control of the numerous items flowing through the various shops. The tags also provide a means whereby the production costs within supporting shops are related directly to the prime work order. This insures that true and complete costs are maintained on all work orders.

Currently, Maintenance Divisions process a great variety of small work orders accompanied by frequent additions and changes. Representing a great challenge to ingenuity and resourcefulness, this challenge is met by progressively developing secondary and tertiary skills within the work force. This maximum utilization of manpower and potential skills enables the Division to provide flexible response to the diversified workload.

Another means of achieving maximum operational flexibility, with low cost, lies in the judicious use of automatic testing devices. Automatic testing devices apply to two general areas. First, where large quantities are processed, automated testers provide rapid, thorough testing, with good low-cost quality control. Second, where a few complex items are processed, these automatic testing devices save considerable time in locating troubles and testing.

181 Tests on Power Supply

An example of this advantageous use of automatic testing devices is a certain tester first used to make 181 tests on the Power Supply of the AN/TPS-1D surveillance radar. The first 120 tests were point-to-point measurements, continuity and resistance. The remaining 61 tests were for applied voltage and leakage in each of the circuits in the unit. Approximately 15 minutes were required to prepare this power supply for testing, 55 seconds for actual testing time, and nine minutes for dismantling the test lash-up. Total time for testing the complete unit was 25 minutes. It would take a trained technician about 12 hours to perform the same tests manually. In addition, the manual method cannot provide the accuracy nor insure the close tolerances obtained with these automatic testers.

Careful attention has been given to the final selection of these instruments. For example, the automatic testers in use at Sacramento are self-checking, thus resulting in reliable and easy maintenance. In addition, they are easily adaptable to any new requirements the Division might have, such as providing surveillance inspection on module and micro-module units. An automatic tester using punched tape would be able to thoroughly check out hundreds of these units in extremely short periods of time. Other progressive methods and techniques employed in the various shops which keep repair time and costs at a minimum utilize sonic and ultra-sonic cleaners, optical comparators, and optical drill presses.

Crystal Fabrication

The Crystal Shops, which are located within the Sacramento and Tobyhanna Maintenance Divisions, have complete facilities and highly skilled personnel to meet almost any crystal fabrication demand. Both of these highly specialized shops are now engaged in such projects as making extremely accurate customized crystals for various Research and Development activities, plus crash fabrication of crystals for the missile and space program at White Sands Proving Ground and the Army Ballistics Missile Agency. Spontaneous reaction to this type of demand is a must since costly missile shoots are directly affected.

In recent months, considerable experimentation has been conducted with the utilization of synthetic quartz in lieu of natural quartz. Thus far, synthetic quartz holds great promise of proving a completely satisfactory replacement or substitute for the natural quartz. This technological break-through has obviated the need for stockpiling natural quartz as a critical material. The workload assigned to these shops is geared to extremely small quantities of crystals, both plated and pressure mounted, over the entire frequency spectrum.

Closely related to this type of work is that of assembling Solar batteries. Tobyhanna now has completed facilities and trained personnel to assemble all types of Solar batteries to be used in satellite and other space programs.

Radio and Television

Another example of the operational diversity in which Depot Maintenance is engaged is in the field of Armed Forces Radio and Television. About two years ago, Sacramento Signal Depot was assigned exclusive responsibility by the Department of Defense to supply and maintain all Armed Forces radio and television stations located at various overseas installations throughout the world. Some 122 radio and 20 television stations are currently operational. Maintenance Division support in this endeavor is both positive and continuing. For example, a simplified television and radio station (commonly referred to as STAR) now operating on Midway Island, is a recent development using standard commercial components.

Three such STAR stations were designed and assembled at Sacramento. Two key parts, a unique optical multiplexer and a control console, both engineered and fabricated at Sacramento, were integrated with the commercial

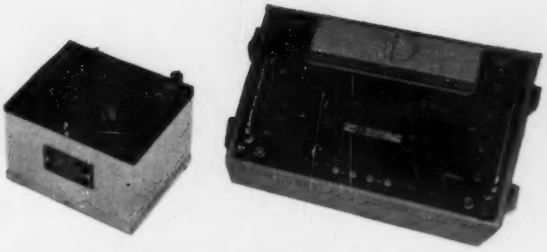
(Continued on page 54)

Interior view of Field Calibration Service van developed by Sacramento Signal Depot Maintenance Division for providing field calibration service on electronic test equipment.

AIRTRONICS Far-end Terminating Set, designed to be used in conjunction with the Model 20B Test Hybrid, supplies the Far-end terminations required for return loss and singing-point tests.

Generally, two precision networks, 115H and 115AL cover the standard cable layouts in exchange plant, (the 115H covering 19 and 22 gauge H88 facilities).

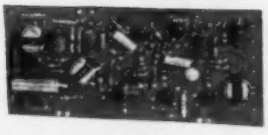
The Far-end Terminating Set consists of a precision network, network build-out decades, selector switch and jacks, and binding posts to give flexible access to the components.



AIRTRONICS new multi-purpose, Portable Test Hybrid Set, Model 20B, makes acceptance, evaluation, and capacity balance tests easier, faster . . . locates cable opens accurately . . . accommodates standard networks. Either Singing-Point or Return Loss techniques can be applied. Accessories include external decade capacitor and variable resistor for use in locating opens, for compromise net, etc. Plug-in dial is also available.

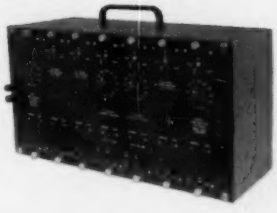
DEPENDABLE PRODUCTS FOR MODERN TELEPHONY

AIRTRONICS completely self-contained Program Equalizer cuts line-up time from hours to minutes. Designed for operating on standard program-loaded or non-loaded communications cables, this unit features pre-tuned circuits in 1½ KC steps from 5 KC to 25 KC. Simple switch adjustments control insertion loss of the LC network, select values of L and C, regulate line-to-drop ratios, control the circuit location of the RLC network etc. Available in portable, wall-mounting, or standard 19" or 23" rack-mounting arrangements.



The Switch-gain Amplifier — in a Speakerphone installation — functions as a voice-sensitive switching pad or loss, which *automatically* lowers loudspeaker volume whenever the subscriber is speaking. Loss is switched electronically to the transmitter channel while the subscriber listens. A guard circuit keeps speaker-to-microphone acoustic feed-back from causing improper switching when the speaker is operating. Net effect is reduction of acoustic coupling between loudspeaker and microphone to a degree where anyone, within 10 or 15 feet, can hear easily and distinctly without feedback or hollowness. Subscriber is not required to vary his gain control when shifting from a near to a more distant connection, or to toll

AIRTRONICS Switch-gain Amplifier fits all Speakerphone models. Priced under $60 f.o.b.



AIRTRONICS standard Artificial Lines accurately simulate a loaded or non-loaded cable pair of any desired length — from 600 to 39,600 feet.* Multi-position switches afford instant control over total length or load section lengths, so that coil spacings may be set to better than 1%, or as much as 10%. Common irregularities such as bridged taps, mixed loading or coils omitted can be introduced in a moment.

*Available with plug-in units for either #22 or #24 gauge cable, or mixed 22 and 24 gauge. Other commonly used gauges available on special order.

another product FIRST from

AIRTRONICS INTERNATIONAL CORPORATION

P.O. Box 8576, Fort Lauderdale, Florida (6900 West Road 84)

how AE helps you

increase your

Compact attendant cabinet for use with AE P-A-B-X systems. Uses less space than a typewriter! Two-tone grey finish blends into the color of any office.

Floor-type attendant cabinet for use with our larger P-A-B-X systems. Choice of Cinnamon Blonde (shown above) or Dark Mahogany finish.

P-A-B-X sales!

Modern dial phones are used with AE P-A-B-X systems. Offered in a choice of 10 decorator colors.

AE Sales Kit includes everything you need to promote P-A-B-X. Built on promotions used by many independent telephone companies.

YOU GET STOCK DELIVERY ON 6 P-A-B-X MODELS!

AE stocks a P-A-B-X board to meet every need of your subscribers. This means you can offer businesses, large and small, a ready-made P-A-B-X system. It means you can give quick service, too!

YOUR CUSTOMER GETS TOP QUALITY!

The backbone of AE P-A-B-X boards is quality. Components are identical to those used in the famous Strowger central office equipment. That's why telephone companies find AE P-A-B-X boards provide dependable service and minimum maintenance.

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AE offers 15 auxiliary services for P-A-B-X systems. These optional features provide additional service for your subscriber—and extra revenue for you! Ask for further information on our complete line of P-A-B-X auxiliary services.

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Prepared by P-A-B-X sales experts. Includes selling plan, complete catalog, sales promotion folders, mailing piece, suggested sales letters, sample survey form and proposal—even a sample contract! To get your free kit, write Automatic Electric Sales Corporation, Northlake, Illinois. In Canada, Automatic Electric Sales (Canada) Ltd., 185 Bartley Drive, Toronto 16.

AUTOMATIC ELECTRIC

Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM

Electrically retrofitting Army aircraft on a prototype basis is an avionics responsibility of the Sacramento Signal Depot.

components, producing a fully reliable low-power television station. This station is another example of a maintenance division's versatility. The creation of STAR reduced the cost of a low-powered TV station from $75,000 to $12,000. An additional feature of this station is that it only requires one-man operation. Other comparable commercial television stations normally require from six to eight operators.

Another example of where the various production shops worked closely together to meet a new requirement is a Field Calibration Service Vehicle, or van. Technicians in the new Pentomic Army require accurate test equipment to maintain efficient operation of highly complex electronic devices. To meet this need, Sacramento's Maintenance Division, on very short notice, designed and fabricated a number of these Field Calibration Service facilities. These vans, containing highly accurate calibration standards, periodically visit Army field installations to check, service, and to calibrate electronic test equipment.

Develops Test Equipment

Considerable research was necessary to determine what kinds of test equipment would best meet the stringent requirements for these vehicles. The demands of driving over rough, dusty roads imposed meticulous attention to suspension systems, weather-proofing and temperature control. This project proved so successful that, today, these Field Calibration Service Vehicles are found in all continental Army field areas and some overseas commands.

To insure the provision of quality equipment of high performance, only quality materials completely conforming with specifications are used. At Sacramento, a professional chemist and a well-equipped laboratory are employed to determine the strength of materials and the properties of lubricants, paints, plating compounds, and other protective coatings. The objective is to produce a reliable product for our customers with "built-in quality."

In order to secure quality equipment, final acceptance is the responsibility of the depot's Quality Assurance Office. To accomplish this mission, the Quality Assurance Office maintains a Repair Inspection Branch which is physically located in the Maintenance Division. This branch is staffed with technically qualified inspectors who check the wide variety of complex equipments that are processed. Where conditions warrant, the equipment is accepted on the basis of the latest statistical quality control techniques and methods. To insure quick-reaction control, quality data is fed back to the Maintenance Division's Quality Control Branch for the purpose of correcting defects, improving in-process methodology, and for an overall evaluation of the shop's performance.

Modern production line techniques are used at Sacramento Signal Depot.

Nucleonics Field

Moving now into the Nucleonics Field, both Lexington and Sacramento Maintenance Divisions have Nucleonics Branches. A few of the important responsibilities of these branches include:

(1) Photodosimetry and radiac calibration service, both within the Continental United States and overseas.

(2) Staff assistance to the National Bureau of Standards and the Surgeon General's Office on research and development of radiac instruments and nuclear testing.

(3) Professional assistance on handling and storage of radioactive materials and equipment.

To accomplish this mission, the Nucleonics Branches are staffed with physicists and highly skilled technicians.

To assist highly-trained personnel in providing quick, quality service, a Chemo-Physics Laboratory is located in the Nucleonics Branch. This laboratory is used for making chemical identification tests, decontamination of materials, and radiation counting. As a special precautionary measure at Sacramento, for example, the atmosphere is continuously monitored to determine whether any radioactivity may possibly be present and, if so, in what degree. In the interest of the community, the results of this monitoring are reported to the California Department of Health.

The photodosimetry service provided requires highly specialized equipment. These precision instruments are used for processing film from badges worn to record the amount of exposure to

(Continued on page 79)

a report on the "three-arm telephone" market

Recently we disclosed the possibility that we might proceed with the development of a smaller, lightweight, two-piece phone that would be ideal for three-armed people.

We know that intelligent marketing begins with customer oriented product development.

That is why we asked you—the Independent Operating Companies—how large the market might be for this "three-handed" telephone.

All the returns received to date represent a preponderance of evidence pointing up one absolute fact; **there just are not enough three-armed people to represent any market at all!**

Accordingly, we have decided to give up, at least temporarily, development of the "three-armed phone".

We shall continue to market phones for ordinary people—the N-541 desk and N-546 wall phones for those who still want a two-piece phone—the Ericofon for those who want the beautiful, lightweight, modern, upright one-piece phone with the dial in the base.

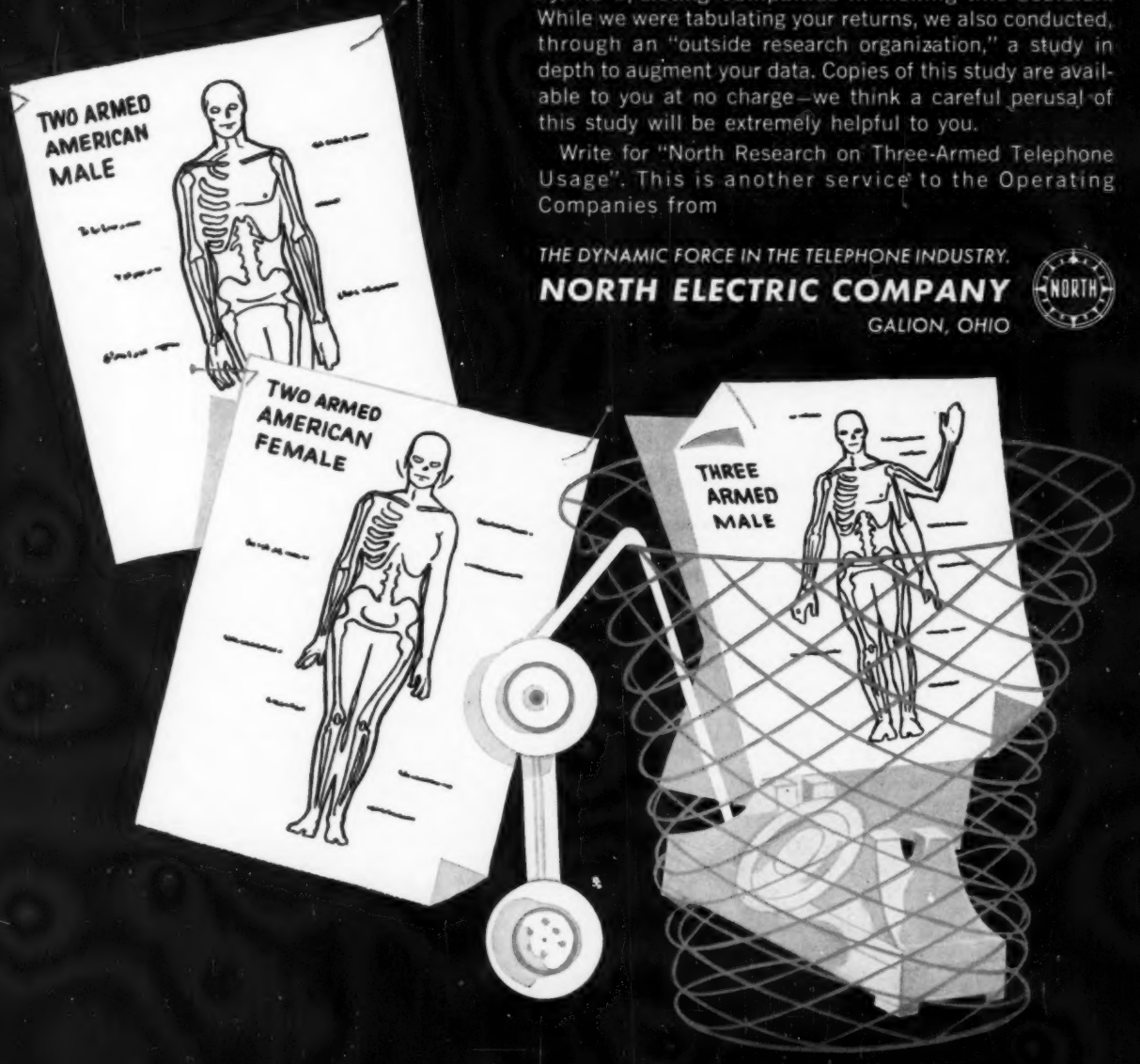
We are deeply grateful for the assistance rendered us by the Operating Companies in making this decision. While we were tabulating your returns, we also conducted, through an "outside research organization," a study in depth to augment your data. Copies of this study are available to you at no charge—we think a careful perusal of this study will be extremely helpful to you.

Write for "North Research on Three-Armed Telephone Usage". This is another service to the Operating Companies from

THE DYNAMIC FORCE IN THE TELEPHONE INDUSTRY.

NORTH ELECTRIC COMPANY

GALION, OHIO



A tape is inspected at the Midwest Relay Station's Incoming Line Position at Fort Leavenworth, Kan. From this point the message will be directed to a cross-office unit or to a cross-office intercept position.

Midwest Relay Station Dedicated

New Link in Army Communications Network

THE DEDICATION of the Army's newest and most modern strategic communications station, the Midwest Relay Station at Fort Leavenworth, Kan., on Feb. 18, was one of the first highlights of the U. S. Army Signal Corps Centennial Year.

It is the second built and largest of three scheduled to go into service in the Continental United States. The first, in Davis, Cal., began operation in 1956, and the third is being completed at Fort Detrick, Md., as one of the major closing events of the Centennial Year.

Thus is the major role of communications underlined in the mission of the U. S. Army Signal Corps on its 100th anniversary.

The first of the three automatic switching centers on the continent, Davis, serves to link the United States with Army commands throughout the Pacific and Eastern Hemisphere. The third, at Fort Detrick, will connect the United States with commands throughout the Atlantic and Western Hemisphere. Together these three stations provide facilities connecting all regions of the United States with communications commands throughout the world.

These relay stations represent a practical and efficient consolidation of the communications facilities provided each of our Army installations in the United States. Instead of separate facilities for connecting each installation with every other command throughout the world, facilities for world-wide communication are being consolidated into these three relay centers.

They will provide circuits for service within the United States and radio and cable circuits to overseas stations. Each installation need only be tied in with one of three centers in order to reach any desired point on the globe.

The Midwest Station is serving as a relay center for messages between Army installations in the Middle West and the gateway communications centers on the East and West Coasts. It will ultimately provide direct high speed radio service to Puerto Rico, Panama, and Hawaii. Operational 24 hours every day and possessing message-handling capabilities of incredible speed and volume, it will provide installations everywhere with a kind of service never before available.

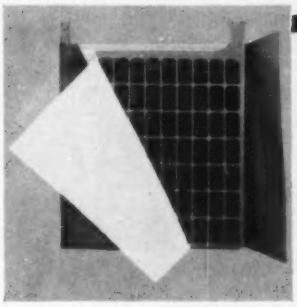
The automatic Midwest Station can handle approximately 200,000 messages a day. An example of its speed and efficiency is that messages passing through the station frequently start appearing on the teletypewriter at final destination before the end of the message has cleared the transmitting point.

Centers Complementary

Each of these major relay centers of the Army complements the capabilities of the others. Destruction or partial loss of one can immediately be compensated for by the other two. The Midwest Station, strategically located as it is, is a keystone in our global communications coverage.

Its completion represents a significant milestone in Army communications. The U. S. Army Signal Corps is proud that it is realized in its Centennial Year, for it epitomizes a Century of Progress in U. S. Army Signals.

It is also historically significant that this modern continental link in the Army's communications should be established at Fort Leavenworth, where the Army's distinguished Command and General Staff College is located. More than 100 years ago this mid-continent point at the intersection of the old Santa Fe and Oregon Trails became a key communications center of the Midwest. For many of those early U. S. settlers who streamed across our Western plains in an endless procession of wagon-trains, the route was through Fort Leavenworth. This community—with this modern gateway and relay facility—continues to serve in the



1984

C & D BATTERY INSTALLED IN NEW, DALTON GEORGIA DIAL SYSTEM BUILT FOR 25-YEAR LIFE

Installed in 1959, the C & D battery in the new dial system of the Dalton Telephone Company shouldn't require replacement until at least 1984. And, during that time, maintenance will be unusually low. ■ The reason? The 24-cell, Type RCT-1680 battery with a capacity of 1680 ampere hours, has especially cast lead-calcium plates 0.226″ thick. They are triple wrapped, not single or dual, and have full thickness frames and through members. Lead-calcium plates are inherently longer lasting than conventional lead-antimony plates. This fact, plus triple wrapping, means active materials stay put and shedding is virtually eliminated. ■ In addition, a check of hundreds of *PlastiCal*® installations throughout the country shows that these batteries usually require watering only once a year because of an unusually low electrolysis rate. Thus, maintenance of a *PlastiCal* battery is drastically reduced.

Get these exclusive benefits from C & D *PlastiCal* Batteries! 1. Perfect cell matching improves performance because all C & D batteries contain AccuPak* plates—automatically pasted and inspected by AccuRay 2. Leak proof post seals. 3. Explosion proof vents which also act as a funnel for occasional water additions.**

For complete details on the premium PlastiCal communications battery, write for Bulletin T-532. If conventional lead-antimony grid batteries (PlastiCell) meet your requirements, ask for Bulletin T-533.

* ® *Trademark, C & D Batteries Div. The Electric Autolite Company*

** *Trademark, Industrial Nucleonics Corp., Columbus, Ohio*

C & D BATTERIES
of Conshohocken, Pa.... Attica, Ind.
DIV. THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell* and PlastiCal® Batteries for Communications, Control, and Auxiliary Power • Producers of AutoReg® Silicon Chargers and AutoCal* Charger-Battery Combinations

Maj. Gen. R. T. Nelson, Chief Signal Officer of the U. S. Army, and Maj. Gen. Lionel C. McGarr, Commanding General, Fort Leavenworth, join in a dual ribbon-cutting ceremony at the dedication of the Midwest Relay Station.

historical role which contributed so much to the development of the United States.

While this is a modern facility today and incorporates equipment and techniques of the latest advances in the art, the station's continued usefulness and efficiency will require it to grow with the times. We are living in an era of revolutionary technological change in communications. New capabilities will be needed to expand its service and efficiency to keep pace with future developments, and with them, additional people.

At the dedication, Maj. Gen. R. T. Nelson, 18th Chief Signal Officer of the United States Army, stated: "I extend my sincere appreciation to all who have had a part in making this station a reality. The philosophy of automatic switching conceived and proposed 10 years ago by Col. Howard Donovan and Mr. William Spanke of Fifth Army was new and untried in military systems at that time.

"Without the close cooperation that existed between the Signal Corps, The Engineer Corps and Industry, the successful completion of this project would not have been possible. Automatic switching and routing of messages in this station employes equipment designed and produced by the Automatic Electric Co. High-speed teletypewriter components were produced by the Kleinschmidt Division of Smith-Corona-Marchant.

"Important contributions were also made by local firms—the Haren & Laughlin Construction Co. and the York Electric Co. on the Relay Building, the A. L. Meyers Construction Co. on the receiver and transmitter sites—and, of course, by the Bell System."

The three stations will aid materially in forwarding the traditional dual role of the U. S. Army Signal Corps, both as a combat arm and as a technical service.

Signal Corps Responsibilities

The Army Signal Corps is a combat arm because it provides combat communications for field armies. Signal personnel perform their work under fire if need be and in forward tactical areas. It is also a technical service because of the complex and technical nature of communications; electronics and pictorial operations and support demands an Army entity which can provide the concepts, research and development, procurement, distribution, and large scale maintenance of these systems and this equipment.

In addition, the Signal Corps is responsible for developing, operating and maintaining the Army's global communication system—Army Command and Administrative Network—or ACAN—which links Army echelons within the continental United States and Army headquarters overseas with the Department of the Army in Washington.

This responsibility includes the quick reaction capability for sudden long-range communications requirements in brush-fire or limited war situations anywhere in the world. The Midwest Relay Station and its East and West Coast counterparts will hold key positions in completing the Signal Corps and Army missions in the event such emergencies occur.

Signal Corps in Combat

The Signal Corps contributes importantly to all three elements of combat effectiveness—firepower, mobility, and command control. But especially is the U. S. Army Signal Corps concerned with command control.

This includes the ways and means of coordinating and directing all our forces, all our weapons, all our efforts, in battle. It is in effect the integrating of the decision maker—the commander—with his total information, communication and weapon-handling systems. This responsibility of command control is one of increasing magnitude, heightened even more by modern scientific advances.

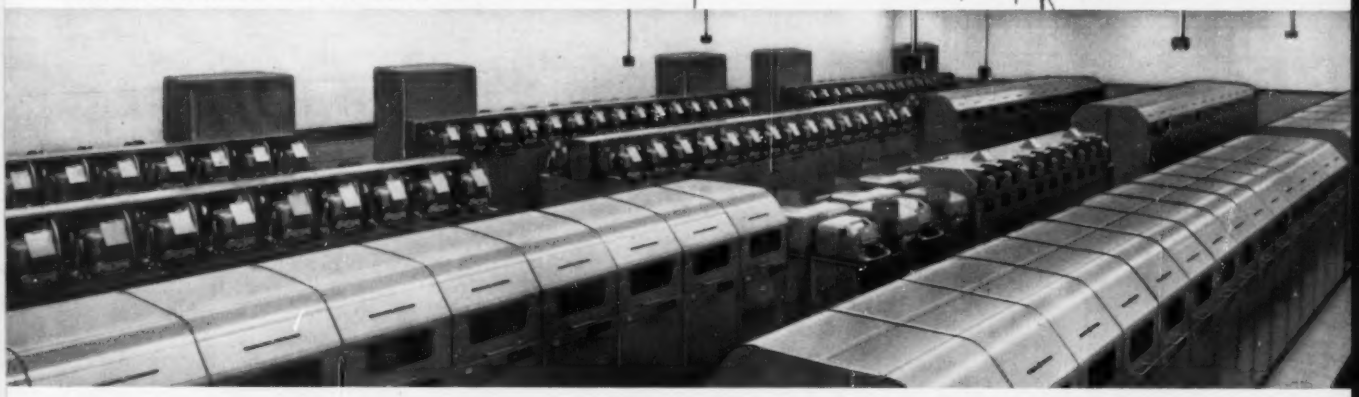
The U. S. Army Signal Corps has played this important role in command control since its earliest days—and found the time and taken the trouble to add its many history-making roles as well—in aviation, weather, radar, and space, to mention but a few.

In the western expansion into the

(Continued on page 82)

1860 AUTOMATIC ELECTRIC SALUTES THE U.S. ARMY SIGNAL CORPS ON A CENTURY OF PROGRESS! 1960

Midwest Relay Station, Ft. Leavenworth, Kansas. AE developed the switching techniques and control devices that automatically route messages to the proper commands and give instant priority to emergency traffic.



The methods have changed, but the spirit remains the same! From signal flags to high-speed automatic communication, the U.S. Army Signal Corps has had a unique record since its founding in 1860. Its accomplishments have been praised by both American fighting men and civilians here and abroad.

Automatic Electric takes pride in its contribution to the new Teletypewriter Switching Centers at Ft. Leavenworth, Kansas; Davis, California; and Ft. Dietrich, Maryland. These relay stations represent an important step in the development of fast, modern communication to meet the increasingly complex requirements of our modern Army.

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GENERAL SYSTEM

Military — Civilian — *Industry Team*

by RAY BLAIN

SINCE its inception, the United States Army Signal Corps has worked as a coordinated team with industry, and this cooperation has always contributed immeasurably to national defense.

When Major Albert J. Myer was appointed Signal Officer of the Army on 21 June, 1860, he made immediate plans for placing the electric telegraph into the field service of the Army. Civilian telegraphers, directly controlled by Secretary of War Stanton, and paid by the quartermaster, were, from the beginning of the war between the states, utilized in the military effort of the north. This was the U. S. Military Telegraph which provided command and administrative communication between major headquarters.

Major Myer proceeded to build a corps of signalmen whose services during the war proved so valuable that a formal U. S. Army Signal Corps was established in March, 1863.

Need of Civilian Engineers

The development and increase in Signal Corps communications during and immediately following the Spanish-American war established a greater need for communication specialists in the Army, which was met by the hiring of civilian communication engineers. Although some of these engineers were hired at $75 per month, the average rate of pay was $1,200 to $1,400 per annum, with a top salary of $1,800 per year. (This was considered a handsome salary back in those days when personal needs were few and prices in general were low.)

During World War I, engineers, civilian clerks, stenographers, telegraph and telephone operators were employed in great numbers. With the cessation of hostilities, the civilian engineering force was further increased to handle the jobs of officers and enlisted men who were being discharged from the service. At that time, an engineer's entrance salary was increased to $1,800 per annum. If he survived a six months' probational period, a bonus of $20 per month increased his annual salary to $2,040.

Again, during World War II, the civilian force of the Signal Corps was still further augmented. Technicians, communication specialists, teachers, expediters, supply management experts, lawyers, and others with varied skills, were added to the civilian forces.

The officer and enlisted personnel of the Signal Corps is rotated periodically. Ordinarily, a tour of duty at any one station is not over four years. This rotation is considered necessary by the Army in order to round out career training of military personnel. This arrangement — while undoubtedly necessary—does possess a distinct disadvantage, in that continuity is lost on many important and specialized jobs.

It is here that the well-trained and qualified civilian employe proves most valuable. In many cases, these civilians act as assistants to the military and carry on the necessary continuity.

Usually, these employes will know personally the civilian suppliers, manufacturers and officials of the commercial communication companies that normally handle army business in an area. This knowledge proves an invaluable aid to a military man starting on a new and often unfamiliar assignment.

Companies Supply Personnel

The commercial telephone companies have also been most helpful in furnishing the U. S. Army Signal Corps with trained personnel.

At the beginning of World War II, the enlisted strength of the entire Army Signal Corps was less than 5,400 men. By late 1942, the strength was greater than the total of all branches of the army in 1939.

This rapid expansion of the Army Signal Corps personnel—and particularly the increase in commissioned officers—was aided by the cooperation of both the Bell and Independent companies of the telephone industry.

Starting in 1939, the telephone industry furnished officers, non-commissioned officers, and technicians as cadres for over 200 affiliated units of the Signal Corps. The Bell System companies sponsored affiliated units with a total personnel of more than 3,000 officers and men—all technical specialists. Independent telephone companies also sponsored numerous affiliated units and technical specialists in substantial numbers. The telephone industry, both Bell and Independent, also furnished several hundred post signal officers and staff officers.

100 Years of Teamwork

In addition to technical cadres for affiliated units, the Army General Staff recognized the value of assigning to the Signal Corps those men with telephone experience who were inducted into the Army during this period. By early 1942, approximately 50,000 men with telephone experience had been assigned by this method to the Army Signal Corps.

The primary purpose of this article is to discuss the excellent teamwork which exists between military personnel and Signal Corps civilian employes, and representatives of industry. The very fine relationship that exists today among these three groups is the result of working together for many years on related problems and having a mutual respect for one another's ability. Cer-

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- **Maintenance-Free Circuitry**
- **±1% Voltage Regulation**
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A magnetic amplifier charging regulator without moving parts helps assure you of consistent voltage regulation within ±1% all the way from *zero* to full load current at the float voltage setting. This includes the particularly important 0 to 15% range.

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Exide®

tainly, this military-civilian-industry cooperation plays a most significant part in the century of progress and accomplishments of the Signal Corps.

One example of this cooperation are the Electronic Defense Laboratories of Sylvania Electric Products, Inc., a subsidiary of General Telephone & Electronics Corp., established at Mountain View, Calif., in 1953 under contract to the U. S. Army Signal Corps. A 76,000 square-foot addition to these laboratories was recently completed. This activity represents a pioneering effort to create a new type facility, operated by a military-industrial team, for quick reaction to enemy weapon development.

These laboratories, located on a 39-acre site, form a part of the Sylvania Electronics system, a division of the company engaged in research, development and manufacturing activities in advanced electronic fields. In addition to electronic warfare and countermeasures, these include special-purpose tubes and devices, data-processing systems, weapons and missile systems, and communications, radar, reconnaissance, navigation, and control systems.

To illustrate the significance of "quick reaction" production, the recent prototype production at the laboratories of seven high-frequency lightweight transceivers for battlefield use is cited. The time span between the requirement for these portable communications sets and the finished equipment was only 90 days.

Over-All National Benefits

Another excellent example of the two-way street, used by both the Signal Corps and industry, is the development of equipment packaging during and since World War II. Because of strict military packaging requirements, the packaging of commercial firms has been greatly improved. By the same token, commercial concerns, as a result of their experience, have made useful suggestions for the simplification of military packaging that has been accepted and has resulted in reduced cost to the Signal Corps.

The Signal Corps has pioneered electronic switching in this country, and development contracts have been made with several commercial equipment manufacturers. This preliminary development work places these manufacturers in a far better position to meet commercial electronic switching requirements as a result of work performed for the armed forces. This is just another case where military and industrial cooperation contributes to the over-all benefit of the country as a whole.

The Signal Corps began to use dial switching equipment during World War I. The training of men in the installation and maintenance of this equipment was one of the problems to receive serious consideration at that time. The problem was solved by arrangements being made to train these men in schools conducted by the various equipment manufacturers. This arrangement continues in use and has proved entirely satisfactory. Men have been trained down through the years by Automatic Electric Co., North Electric Co., by Stromberg-Carlson, and by Kellogg Switchboard & Supply Co. These companies do not charge the military for this instruction. Transportation and living expenses are paid by the Army while the men are in school.

Ray Blain (right) is presented with a copy of the U.S. Army Signal Corps history by Col. G. P. Sampson, Chief of Army Communications Systems Division. Mr. Blain, chief engineer of the U.S. Army Signal Engineering Agency, has been a U.S. Army Signal Corps employe or soldier for more than 42 years.

Special training in teletypewriter maintenance has also been provided by the Teletype Corp. and by the Kleinschmidt division of Smith-Corona-Marchant.

Men in large number are also trained in dial equipment installation and maintenance at the Signal Corps schools at Ft. Monmouth and Ft. Gordon. While these schools are excellent and adequate, the supplemental training in industry's schools insures that instructors and key installation and maintenance personnel keep up-to-date at all times on new equipment, testing methods, and maintenance practices.

Product Qualification Plan

Another excellent example of military-industrial cooperation is the "Reduced Inspection Quality Assurance Plan," an arrangement worked out between the United States Army Signal Corps and the Stromberg-Carlson Co. All products now being manufactured for the Army Signal Corps by Stromberg-Carlson's Telecommunication Division are qualified under this plan.

Products are qualified for acceptance under this plan only after repeated evaluations have satisfied the Army Signal Corps command that the exacting military specifications for these items of military equipment will be met under the manufacturer's own quality control program, with less-than-normal inspection by Army Signal Corps quality assurance personnel.

AFCEA Vital Force

Brig. Gen. Elmer L. Littell, Commanding General of the U. S. Army Signal Supply Agency, in Philadelphia, recently advised the Stromberg-Carlson Co. that "the operation of this plan will work to our mutual benefit in reducing costs and improving our relationships, at the same time insuring the delivery of a high-quality product to the Army."

The Armed Forces Communications and Electronics Association is another example of military and industrial cooperation. This association was founded in May, 1946, and incorporated under the laws of the District of Columbia. Its objective is to maintain and improve cooperation between the armed forces and industry in the design, main-

FROM SIGNAL FLAGS TO SATELLITES...

These symbolize 100 years of progress in military communications—100 eventful years during which the U.S. Army Signal Corps has met communications needs that grew ever more complex and spanned ever longer distances.

Tomorrow offers the prospect of a new and even more exciting era, through space communications. We know the Signal Corps will meet the challenge as it has in the past—with vigor, imagination and confidence.

Teletype Corporation is proud of its many years of association with the Signal Corps, years that have seen the teletypewriter advance steadily to today's fast, compact machine—lightweight and nearly as portable as the early signal flags.

We salute the U.S. Signal Corps on this, its 100th anniversary. We salute, too, the many significant contributions that Signal Corps pioneering has made to communications technology.

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Choose all your cords from COMCO

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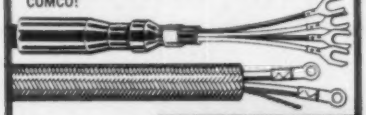

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tenance and operation of communications, electronic and photographic equipment in time of peace as well as in time of war, and, in addition, endeavor to foster appropriate measures toward the development of adequate reservoirs of scientists and engineers in the United States.

Numerous electronic and communication firms are sustaining and group members of this association. By their membership, these firms indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employes or officials for membership, thus forming a group of the highest trained men in the communications fields, available for advice and assistance to the armed services in research, development, manufacturing, procurement and operation.

For normal operations, Signal Corps requirements are forecast and the procurement of hardware is initiated well in advance of the time it is actually required for installation. Unfortunately, however, during periods of actual warfare and police actions, such as that in Korea, and in putting out brush fires in various areas of the entire world due to the cold war, things cannot always be handled in a normal routine manner. The cooperation of Signal Corps suppliers and manufacturers from industry in the handling of these special cases has been particularly outstanding.

There are numerous cases on record in which suppliers have worked around the clock, seven days a week, in order to meet special and urgent Signal Corps requirements. Equipment has also frequently been diverted from less important commercial orders to meet urgent military requirements. Often, commercial type equipment has been modified on a "crash" basis to meet a specific military need. The design and manufacture of special wires and cables in order to meet special conditions has been a rather common occurrence.

With a view to presenting our story of this military-industry cooperation in an understandable manner, the following cases of actual happenings are being related. These are not only true happenings, but are, we believe, good examples of accomplishments that can and do happen frequently in connection with the many problems encountered in national defense.

The Signal Corps had a requirement for over 700 wood poles, 150 feet in length, for use in supporting rhombic antennae. The pole industry was canvassed and it was learned that poles of this length in the number required could not be obtained. It was then decided that spliced poles must be used. The poles were finally procured on the west coast. They were then shipped to a wood treating plant in the middle west and unloaded.

Signal Corps representatives worked with the pole people and devised a satisfactory means of splicing the poles. They were then matched, spliced, treated and numbered so that the proper sections could be identified when they arrived at their destination. The poles were then reshipped to the east coast where the radio stations were being constructed.

When this requirement was first made known, it was generally considered to be impossible to meet. However, with the able assistance and cooperation of the pole industry, it was not only carried out successfully, but within the time limit, and at a reasonable cost.

One day during the war years, a visitor called at a Signal Corps office and explained that his company manufactured a small, oil-free air compressor. He inquired as to whether it would serve any useful purpose in the war effort. At that particular time, we were having considerable difficulty in obtaining tanks for oil-pumped nitrogen gas used for the flash testing of cable splices. This manufacturer was advised that if he could connect his compressor to an electric motor or small gasoline engine and devise a means of extracting the moisture from the air, we could probably make use of it in lieu of gas for cable testing.

As a result of this conversation, the manufacturer mounted the small compressor on a portable base with an electric motor. The air output from the compressor was piped through two glass containers of desiccant. The desiccant changed color when it absorbed moisture to the point that it required reactivation. The second container provided the necessary margin of safety to insure an adequate supply of dry air for cable testing.

These units proved highly successful and were purchased in large numbers and used to good advantage on many important cable-splicing jobs during, and for several years after, the war. Larger compressors, equipped with air dryers, are now used extensively to maintain cable systems under constant pressure. One manufacturer recently informed us that his company alone had sold more than 5,000 such units to operating telephone companies. This highly successful system unquestionably had its beginning in our office that day when a manufacturer wanted to know if his little compressor could contribute anything to the war effort.

A more recent problem that confronted the military-civilian employe-industry team is the mechanization of

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Whether you're pulling or setting poles, hanging transformers or doing other precise hoisting, the double-action hydraulic cylinders of the redesigned PM-20 Derrick will do the job up to 40% faster ... with less manpower. This new torture-tested, heavy-duty derrick withstands extreme lateral strains ... weighs less, yet lifts up to 5 tons ... body loads up to 2,500 lbs. ... operates through an arc exceeding 200 degrees from stored position to within 18″ of the ground ... does not creep or "kick-back" under load ... and provides sufficient down pressure to dig fast, clean holes.

The PM-20 is available in three standard sizes to handle 40′, 55′ and 70′ poles. An optional hydraulic or manually operated head sheave extends 56″ to increase the reach to 25½′, 29′ and 34′ for hoisting 50′, 65′ and 80′ poles.

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Frame-guided EM-2 Digger installed on PM-20 Derrick digs holes ... vertically or at angles ... from 9″ to 30″ in diameter and up to 10½′ in depth.

Series PM-10 Hydraulic Derrick digs, lifts and loads ... exceeding most rigid utility requirements.

Series PM-30 Oscillating Hydraulic Derrick corner mounts. Digs, hoists to rear or either side of parallel parked truck.

Both derricks lift up to 4 tons; arc in excess of 200 degrees; handle 40′, 50′ and 70′ poles; body load up to 2500 lbs.; exert down pressure for digging. Extendible hydraulic head sheave optional with PM-10 and standard with PM-30-55 and 70.

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large military PBX telephone systems. This involves both "in" and "out" dialing which reduces the operating cost considerably and greatly improves the service. Each telephone on the military system is assigned seven digit numbers, and outsiders may dial them direct without manual handling by the PBX operator. Likewise, telephones on the army system dial out on both local and toll calls without assistance of the PBX operator.

The provision of this new service involved planning and engineering by the Signal Corps engineers, and, for army-owned systems, the purchase of equipment was necessary to provide the new service. On commercially leased systems, arrangements had to be made with the operating telephone company to provide the necessary special equipment on a rental basis. The equipment manufacturers, and Independent and Bell telephone companies have all been most cooperative in the provision of this new and improved service.

The first system mechanized in the Army, and the only commercially rented system converted to date, was at Fort Devens, Mass. The New England Telephone & Telegraph Co. provided this service on a rental basis and in a most efficient manner. Fort Benning, Ga., a government-owned system, was the next conversion. Here, the Southern Bell Telephone & Telegraph Co. was most cooperative. The next conversion was at Fort Riley, Kan., where the Fegan brothers, owners of the Junction City Telephone Co., cooperated in solving the numerous problems involved. Here, also, the Fort Riley telephone numbers are listed in the Junction City telephone directory, an arrangement that proves beneficial to all residents of the community.

Then, came the Presidio of San Francisco, Cal., where in and out dialing is proving both successful and popular. Here, the Pacific Telephone & Telegraph Co.'s engineers and officials went "all out" to solve problems, regardless of whether they were of Army or telephone company origin.

Several other larger army telephone systems are scheduled, or are being considered for mechanization. Through the cooperation of military-civilian Signal Corps engineers and industry, this program will permit a tremendous savings in funds, while improving and speeding up the telephone service in general.

A CENTURY OF U. S. ARMY SIGNALS

Continued from page 25

the previous World War, not so much in manpower, as in research, development, and production. While the Corps leaped from 27,000 to 350,000 officers and men in four years, enormous and increasingly intricate growth occurred in the research, development, and supply of equipment, in the training of men in the applications of new electronic devices and weapons previously unheard of: complex radios in every tank and command car (push-button FM radio), mobile long-range radio, radio relay, carrier communications, radioteletype employed in the new world-wide system of ACAN (Army Command and Administration Net), and in radar.

Radar alone soon equaled the great variety of radio and wire items in the many forms in which this new technique developed — radars both for ground troops and for the explosively expanding Army Air Corps.

Under Maj. Gen. H. C. Ingles, Chief Signal Officer, 1943-1947, the Army Signal Corps emerged from the four-year ordeal much larger and with far wider activities and responsibilities than ever before. This was true, despite the fact that the Corps lost to the Army Air Corps, late in 1944, all electronics responsibility for aviation, and lost, late in 1945, all radio intelligence activity. This last, a specialized application of communication-electronics, had greatly expanded during World War II. Though these losses momentarily cut away from the Corps nearly half its men and activity, within a few years, the Signal Corps' assumption of new and important missions regained and enlarged its stature in the Army.

Electronics Stressed

For a while after World War II, the personnel of the Corps declined, reaching a low of about 50,000 in early 1950. Its schooling tasks, which had mushroomed during the war to include Camp Murphy in Florida and Camp Kohler in California, were reduced to the basic schools at Monmouth.

But the communication-electronics sciences could not be permitted to lapse. These fields were increasing dramatically in importance. The several laboratories which had spread out in the Monmouth area since the 1940's began by 1954 to consolidate in one huge hexagonal building, the present U. S. Army Signal Research and Development Laboratory at Ft. Monmouth.

The fact that significant research and development did not greatly decline was exemplified by man's first contact with the moon, accomplished by Army radar at the Signal Corps Radar Laboratory, Camp Evans, Belmar, N. J.

In 1946, this proved the feasibility, and marked the beginning, of space communications in which the Corps continued to pioneer, culminating in SCORE—the Army-developed signal communications relay equipment—which radioed President Eisenhower's Christmas message to the world from outer space in 1958.

Under Maj. Gen. S. B. Akin, Chief Signal Officer, 1947-1951, the special skills and technologies of the Signal Corps were maintained. The world-wide communications of the Army Command and Administrative Network (ACAN) continued to improve the services required by the Army and government personnel in many overseas locations.

Radio-relay techniques were improved and the equipment received ever wider use. It was radio-relay teams of Signal Corps on occupation duty in Japan that suddenly found themselves in June, 1950, called upon to support a conflict in a new sort of war in a new setting, supporting the United Nations in Korea. The first Army troops, and the first casualties in that land, included Signal Corpsmen flown in from Japan.

Korean Combat Requirements

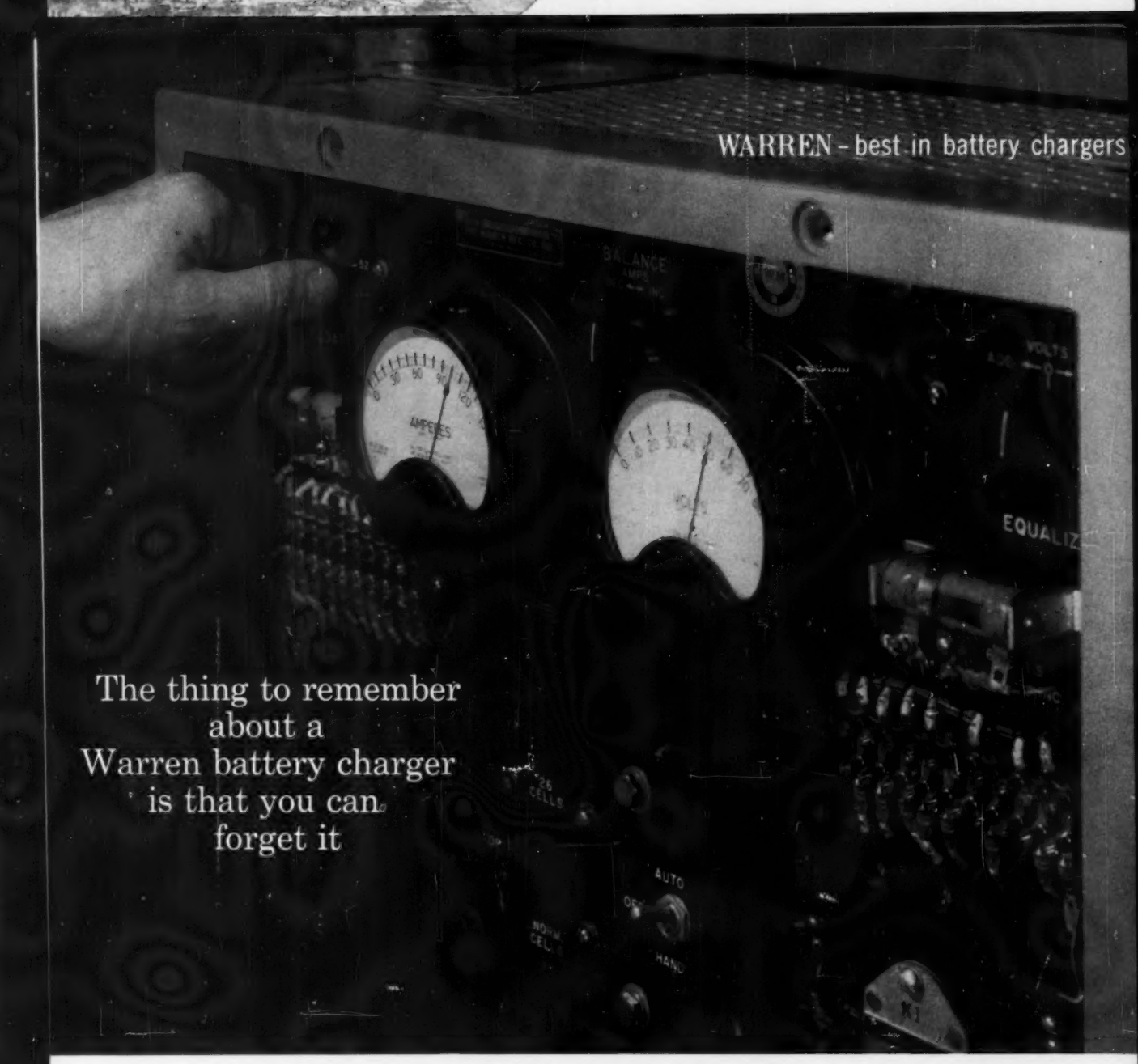
Korean combat placed new requirements on the Signal Corps. The renewed use of aircraft in the Army, including helicopters, demanded special communications and navigation equipment. Ground forces demanded new and better ground radar—mortar locators and troop detectors particularly. Again the Corps underwent wartime expansion, under Maj. Gen. G. I. Back, 1951-1955.

New schools were required at San Luis Obispo in California and at Camp Gordon in Georgia to supplement the Army Signal School at Ft. Monmouth. The Fort Gordon School continues today as an essential signal training installation, the U. S. Army Signal Training Center, which includes the Southeastern Signal School.

In the years since the Korean War and especially under Lt. Gen. J. D. O'Connell, 1955-1959—the first Chief Signal Officer to receive the rank of lieutenant general—there was a tremendous rise in communications-electronics.

Electronic support for guided missiles began in 1949 at the Army's White Sands Missile Range in New Mexico and soon grew into the large U. S. Army Signal Missile Support Agency. The experience and early participation in this phase of communications-electronics work was to permit the Army Signal Corps to provide major science and electronics support to subsequent missile and space programs.

Electronic warfare and countermeas-



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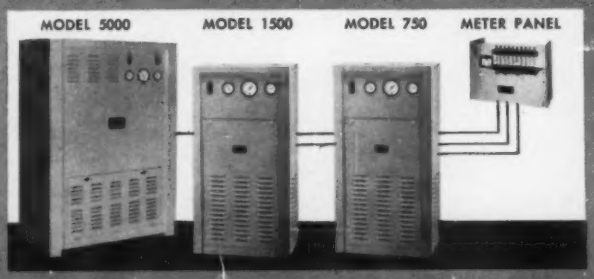

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ures efforts which began modestly at Ft. Monmouth in 1950 quickly expanded, by 1954, into significant developments at Ft. Huachuca, Ariz., where the Army Signal Corps now operates the U. S. Army Electronic Proving Ground. Here important test and evaluation work is carried out on newly developed Signal Corps equipment and systems under simulated and actual field conditions.

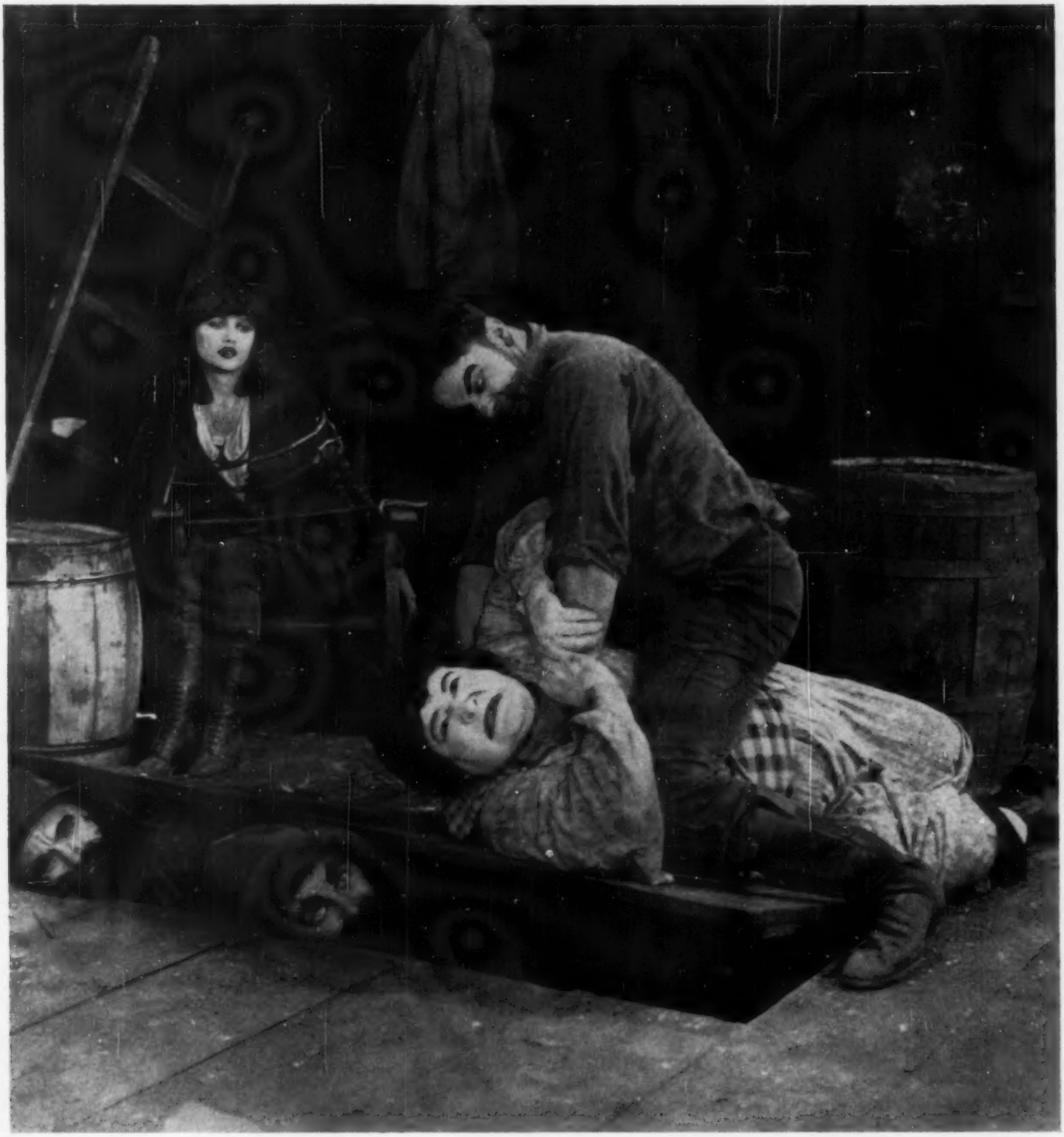
Nike and Hawk Developed

Phenomenal growth in recent years —accelerated by the missile and space era—has characterized numbers of other major Signal Corps efforts. For the nation's air defense, Missile Master, an electronic control and coordination system for use with Nike and Hawk missile batteries, was developed by the Corps and industry. The first operational system was put in action at Ft. Meade, Md., in December of 1957. Additional systems to perform this vital electronic air defense mission are being installed at key complexes throughout the United States.

The advent and rapid development of Army missiles brought forth a relatively new and expanding electronics mission area for the Signal Corps—that of combat surveillance and target acquisition—essentially gathering information day and night, in all weather, about the enemy for employment of weapons systems against him.

The U. S. Army Combat Surveillance Agency was established to provide direction for this major systems area. The Corps developed and introduced on an expedited basis a number of surveillance equipments—a few of these, modified versions of existing off-the-shelf type items. Among these new equipments were first-generation pilotless surveillance drones; the man-packed Telescout television system; mobile and portable surveillance radars, one weighing only 80 pounds; and sensors such as airborne radars, infra-red and photographic cameras. Development continues toward improved systems utilizing a variety of means—radar, photography, infra-red, TV, seismic and acoustic—some to be carried in advanced surveillance drone vehicles and manned Army aircraft.

Significant advances were made in avionics, involving electronic devices and communication for Army aircraft. Besides communication sets, a mobile control tower was developed. The Corps is developing in a joint program with the Navy, an instrumented flight system for helicopters and fixed-wing aircraft, with real picture presentation to the pilot. Also in progress are navigational systems employing visual map presentation to show the pilot the in-flight location of his plane.



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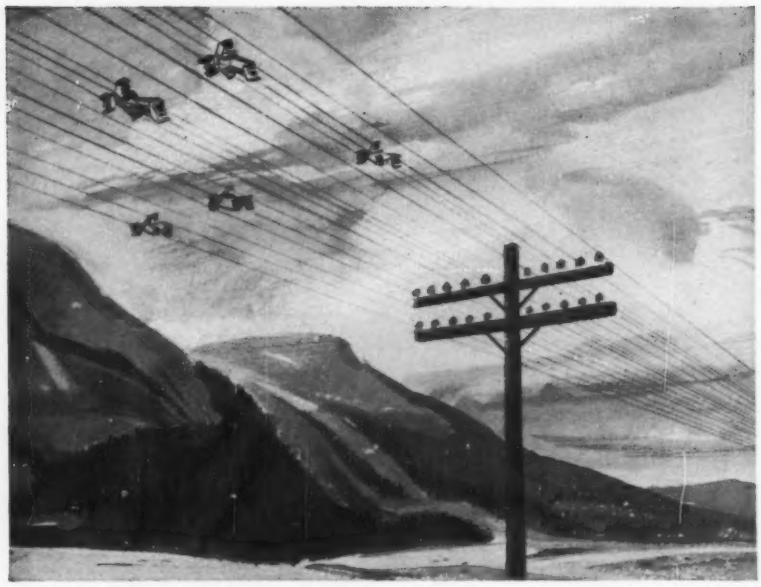

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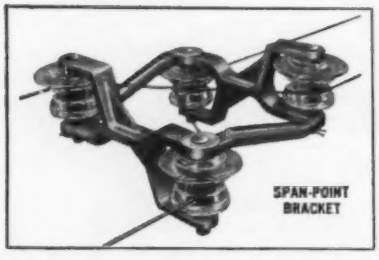
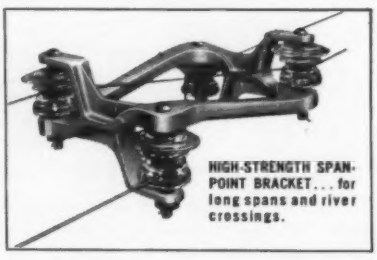


SPAN-POINT BRACKET



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Automatic data processing, added to the world-wide ACAN system in 1955, is being directed to tactical communications; and militarized equipments for use in the field army are under development. The first model of MOBIDIC, a large mobile all-purpose computer, will be delivered to the Signal Corps this year (1960). These and other advances in elaborate tactical communications, including a tiny belt-pack or helmet radio carried by an individual soldier, made possible by micro-miniaturization techniques; mobile and air-transportable long-range communications central for STRAC-type missions; and satellite communications have revolutionized once again the art of military signaling founded by Major Myer 100 years ago.

Besides the "talking satellite" of Project SCORE, which first actively relayed voice and teletypewriter signals through outer space, the Army Signal Corps developed the solar cell conversion for powering satellite radios—initially used on Vanguard I, launched Mar. 17, 1958. This satellite, the first in the world known to use solar energy for its radios, is still transmitting after more than a year in orbit. A more complex solar ring was designed and constructed by the Army Signal Research and Development Laboratory for Explorer VII, which went into orbit in October of 1959.

The Corps also helped to carry meteorology into space. A unique type of Signal Corps satellite instrumentation —the cloud cover or weather experiment—was placed in orbit Feb. 17, 1959. Although spin problems of the satellite prevented successfully obtaining the cloud cover photos intended, the experiment was an initial step in using satellites for cloud cover study and related forecasting and storm detection. Future satellites of this type are planned, such as TIROS under the National Aeronautics & Space Administration.

Mobile Equipment Designed

Under the 18th Chief Signal Officer of the Army, Maj. Gen. R. T. Nelson, appointed May 1, 1959, the Army Signal Corps continues to seek improved command control systems of communication, combat surveillance, electronic warfare, and avionics for the Army, and to contribute to the electronic science and capability of America's space effort.

Among promising equipments and systems under advanced development are:

A mobile radio switching central carried in an Army vehicle which handles up to 48 radio subscriber sets in jeeps, much the same as a telephone switchboard, intended primarily for battle group use.

A push-button telephone to replace the conventional dial type.

Smaller and lighter miniaturized telephone, teletypewriter and radio equipment for combat, including a four-wire telephone system that features a mobile electronic telephone switchboard.

Jet surveillance drones and advanced sensors of greatly improved resolution and discrimination.

Small tactical ADPS equipment, involving a minimum tactical computer weighing no more than 175 pounds, and a mobile decision-making complex for the commander called a Tactical Operations Central, in which visual displays of information and communications means will be centralized.

For the control and coordination of Nike and Hawk Missiles in the combat air defense of field armies, Missile Monitor, now tested and accepted, is already being deployed.

UNICOM (Universal Integrated Communication System), a concept for a global communications system which will provide personalized service, high-speed automatic switching, and any mode of transmission such as video, data, facsimile, voice, and records communications on a completely secure basis, is being pressed forward. With this system should come the use of communication satellites as repeaters—corollaries of the ground stations.

Among forthcoming communications satellites on which the Army Signal Corps is performing work is Courier, the first phase of Project NOTUS. Courier's purpose is to develop a prototype of a global communications network of communicating satellites.

From flags slowly spelling out words, military signaling has moved into electronics, for whose capabilities words and human speech are much too slow. In the lightning fast future of electronic computing machines, and of electric signals which, at speeds measured in millions of bits of data per second, flash to the ends of the earth and far beyond through the infinity of space—in this future the U. S. Army Signal Corps' wigwag flag and flaming torch becomes the symbol for the new era of communications-electronics of the United States Army.

Alaskan Communications

To provide an extensive system of military telegraph lines and undersea cable for Alaska, the Army Signal Corps organized the Washington-Alaska Military Cable and Telegraph System on May 26, 1900. After several years of construction, most of the principal towns of Alaska were linked with the United States and Canada by undersea cable and overland wire. Beginning in 1903, radio communication supplemented the wire and cable system. In 1936, the system was renamed the Alaska Communication System.

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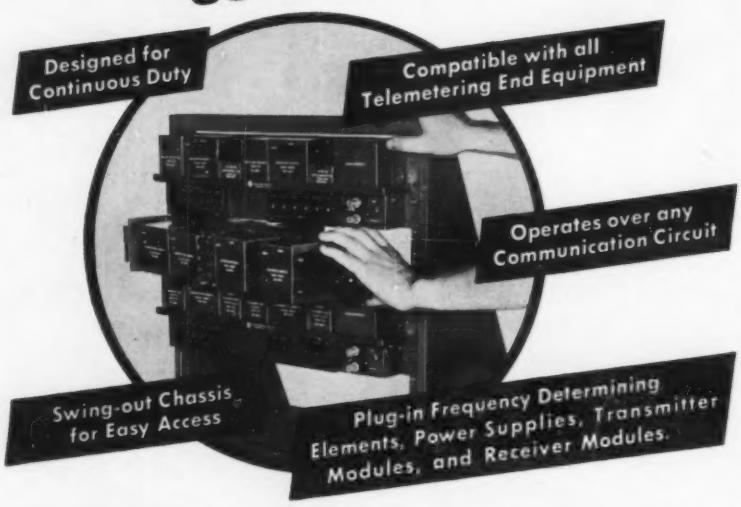
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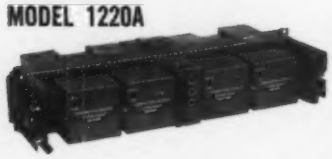
Plug-in Frequency Determining Elements, Power Supplies, Transmitter Modules, and Receiver Modules.

The Model 1220 and 1220A Carrier Terminals are completely transistorized and may be operated from station batteries from 12 to 130 DC. Plug-in power supply is available for 115-volt AC operation. All components, including amplifiers, frequency determining components, and power supplies are contained in plug-in modules, and may be readily interchanged. As many as 22 high-speed channels are available between 300 to 3000 cps.

MODEL 1220

The Model 1220 Terminals are normally used in telegraph applications and provide all necessary carrier and loop jack fields, as well as loop current controls. Two transmitters, two receivers, or a transmitter receiver are available on a single 5¼" x 19" chassis. Operates from station battery or 117-volt AC line.

MODEL 1220A



The Model 1220A Terminals are normally used in telemetering and control applications. The individual modules are mounted on a swing-out chassis and are readily accessible. Four transmitters, four receivers, or two transmitter receivers are available on a single 3½" x 19" chassis. Operates from station battery or 117-volt AC line.

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ARMY COMMUNICATIONS

Continued from page 30

only planned to use the COURIER for bulk-type traffic not requiring immediate transmission.

An experimental COURIER satellite will be placed in orbit in the middle of this year. At that time, we expect to have two ground stations in operation to support the research and development (R&D) program; one in Puerto Rico and the other in New Jersey. The R&D program, consisting of several firings, will end by 1961. At that time, it is expected that the ground stations and any orbiting functional satellites will be turned over for operational employment.

Subsequently, three additional ground stations will be added to the COURIER system. Thus, the COURIER system will provide by 1963 a high-capacity and high-reliability bulk transmission system for handling all traffic not requiring immediate transmission.

In addition to the active R&D project on the COURIER, the early stages of development for a Real Time communication satellite are underway.

The general concept of the Real Time Satellite System, as presently visualized, will consist of three satellite-borne broadband repeaters located at such an altitude and position as to provide virtually complete coverage of the earth with the exception of small areas at the poles.

To achieve this criterion, the satellites will actually be at an altitude of 23,000 miles from the earth. Communications between ground stations will be accomplished by transmitting the information back to another ground station. For transmission between widely separated areas on the face of the earth which cannot be viewed from a single satellite, communications will be from the ground station through a satellite repeater and thence to the ground. We expect operation before 1967.

Even with UNICOM and satellites, the Army is not so naive as to believe that the ultimate is at hand. The process remains in evolution; and a revolutionary approach to meet the space age challenge with now-unheard-of means is dependent upon concerted effort by the Army and industry.

It is within the realm of realism to believe that communicators in uniform or in mufti can together meet the challenge at hand. It is a truly urgent requirement of national significance which dictates the dedicated effort of the entire communications complex if the needs of our country are to be met—in peace—in defense— or in war.

COMMAND CONTROL

Continued from page 34

data, such as radar signals or television, the drone continually transmits the surveillance data via radio while in flight—the signals being received and recorded by the ground station. Upon completion of a mission, the drone returns to the vicinity of the ground control station; where it is retrieved and relieved of its cargo of tactical data.

Aerial Camera in Future

One type of drone sensory device, the aerial camera, is destined for considerable future employment. Photography, particularly air photography, has long been one of the best means of obtaining information about the enemy and terrain at great distances. Many photographic refinements of recent years can now be combined with the "natural aptitude" of the drone for this kind of aerial surveillance. Air-dropped photoflash cartridges and an automatic flare ejection device now provide the necessary artificial light for night photography with drones. Industrial development of more sensitive film, however, may eventually eliminate the need for artificial light.

As a further refinement of drone aerial photography, future developments include in-flight film processing and radio-facsimile transmission of pictures directly to the ground control station. This will increase the speed of acquiring data, and eliminate hazards of possible loss should drones fail to return from their photographic missions.

All data, whether acquired by photography or other sensory devices, must be collected at a central point—for correlation, storage and display. Data processing equipment will ultimately replace manual methods to further insure that the combat commander receives accurate, complete and timely information.

Emphasis on Electronics

The importance of these systems and devices is not so much their individual significance as new technical ideas, or their collective evidence of future planning, but rather their predominance in the vast, dynamic change in military philosophy and the growing emphasis on communications-electronics. Throughout this momentous transition in military tactics, communications and electronics play a dominant role — more important than ever before in history.

The U. S. Army Signal Corps has been a leader in the meteorological field since 1870, when Congress authorized a national weather service and assigned

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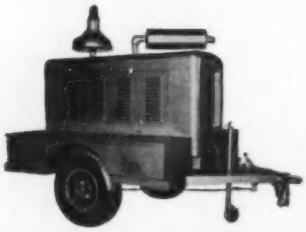
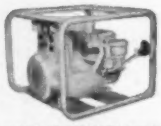


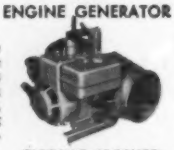
Units provide both single phase power for lights and 3-phase power for other needs. Many exchanges in an area can be served by a single unit.

Telephone systems use U.S. portable generating sets for on-the-spot power needs. Sizes 750 watts and larger, air-cooled.



ENGINE GENERATOR

Portable engine blowers provide convenient means of furnishing fresh air to manholes, or for ejecting smoke, fumes, etc.



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the function to the Army Signal Corps.

During World War I, the Army Signal Corps organized a second weather service to meet the needs of the U. S. Army at war, with its new weapon, the airplane. This second Signal Corps meteorological organization has now become the Air Weather Service of the U. S. Air Force.

The challenge in meteorology today is greater than ever before. The ability to make perfect local weather forecasts is one of the most urgent needs of many activities, including the military. Such ability can be developed only through intensive research into the causes of local weather variations.

If we are ever able to modify or control the weather, even to a limited extent locally, we will have a weapon more potent than the atomic bomb. If we could change our environment, we could change the face of the earth. The atmosphere contains tremendous amounts of energy. If man could learn to harness this energy, he would have a greater source of power than all of our oil, gas and coal reserves combined.

The Signal Corps program is contributing to the eventual realization of this dream.

Our goal—that of the U. S. Army Signal Corps and our industrial partners in defense—is the earliest possible completion of the research, development, testing, and production of the many items of equipment in these important elements of command control: Communications, avionics, and combat surveillance, each of which is required by the modern field army.

SIGNAL SUPPLY AGENCY

Continued from page 35

with purchasing and handling supply and equipment had been foresighted. They had accumulated and stored quantities of signal equipment, including pack and truck radio sets, heliographs, flag sets, and wire. These proved of inestimable value to the troops.

The number of civilians in the Office of the Chief Signal Officer assigned to the office work of supervising the storing and issuing of equipment in depots varied between four and six. These people handled all details necessary in issuing the equipment. The impact of the tremendous task of equipping the rapidly mobilizing Army with signal equipment from the start of World War I until 1920 was felt especially in the storage and issue activities, and obviously the number of people designated to do the job increased a hundred-fold.

Significant developments came about with the first nomenclature or code for items procured and issued as signal equipment, which occurred in 1919; the publication of the first Signal Corps Storage Catalog in 1921; the defining of the Storage and Issue function in 1936.

$4.5 Million in Equipment

In the procurement part of our function, the procurement district, in 1939, consisted of one officer and 14 civilians. It purchased, inspected, and shipped during the year, 4.5 million dollars worth of equipment on approximately 2,400 contracts and orders.

In 1940, wise heads, mindful of chaotic world conditions, built the foundation necessary to bear the staggering load that was to be placed on the Army Signal Corps during World War II. Then came Pearl Harbor—Dec. 7, 1941—a stunning challenge to the people charted with the responsibility of logistical supply.

Top echelon felt that the job could be best accomplished by having all phases centralized at one point. The procurement district and depot, comprising 500 people, moved from Brooklyn to Philadelphia in October 1941. On Oct. 8, 1942, the Storage and Issue Agency of the Army Signal Corps, numbering about 800, moved from Washington to Philadelphia. Each was a separate activity, but there was a common administrative and housekeeping function.

Expanded Activities

During World War II, the inspection of material purchased by the Philadelphia Signal Corps Procurement district was made by an inspection agency with zones located in Newark, Philadelphia, Dayton, Chicago and San Francisco. At that time, the number of items being purchased were estimated at 70,000. They included such diversified items as enough wire to encircle the globe 20 times, radio receivers and transmitters, beeswax compound, vacuum tubes. In those days, the Army was using pigeons to fly over battle areas when radio communication could not be used without divulging locations. For these messengers, which carried important messages strapped to their legs, the district purchased pigeon food—as much as 1,000 tons, comprising a mixture of Kaffir, corn, New Zealand or Tasmanian peas, millet seeds, vetch and wheat. This was packed in fumigated and hermetically-sealed metal containers. Nomenclature PG-40, on a purchase order, signified pigeon drinking fountains and glass eggs.

Today we occupy a 15-story building

on Rittenhouse Square in Philadelphia, Pa. We have four major activities—Stock Control, Procurement, Industrial Preparedness, and Quality Assurance—each devoted to one global mission of supplying vital communications-electronics equipments and supplies for national defense. These activities are supported by an integrated data processing activity, an administrative services activity, and other staff offices, which, together, provide the latest technical know-how, tools, and services required to keep USASSA in step with the ever changing supply needs of the military. We have regional offices in Chicago, Ill. and Pasadena, Cal. Three procurement offices are maintained in Washington, D. C., Fort Monmouth, N. J., and Fort Huachuca, Ariz. Recently, we also established an Inventory Control Office in Lexington, Ky.

180,000 Items Handled

It is a far cry from the 2,500 items of signal equipment that were available in 1917; the 70,000 being purchased in 1943, to the 180,000 now being procured, cataloged, and stored in depots in the Continental U. S. and overseas. In 1939, 4.5 million dollars worth of equipment was purchased; our annual expenditure now is over one-half billion dollars. We are the national inventory control point for stocks maintained in the four large Army Signal Corps depots in Decatur, Ill.; Lexington, Ky.; Sacramento, Cal.; and Tobyhanna, Pa. Our total inventory is estimated at approximately 1.1 billion dollars. Among major items purchased and issued are transatlantic radio transmitters, highly complex radar stations, global communication systems, and communication satellites. Both small and big business companies share in awards for research and development, service test, industrial preparedness measures, production, communications systems, and operations studies.

No article about USASSA would be complete without a tribute to industry—our indispensable partner in assuring the success of our mission. America's defense depends upon its industrial greatness—the cooperation of industry and science with our defense officials, its making its inventive genius available to our needs. Through the years, we at USASSA have placed great emphasis on good relations with industry. Our suppliers have more than justified our trust. The research and development, and subsequent production accomplished by industry at the request of the Army Signal Corps, has continuously given birth to more efficient equipment to assure that the Armed Forces is equipped with the

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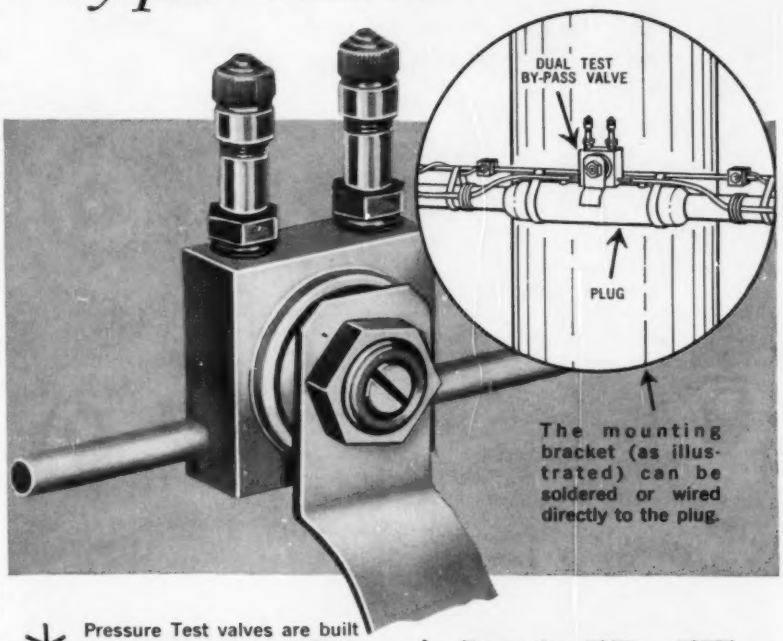
Dual test by-pass VALVE!



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This valve is ideal for all cable bypass installations. Pressures on both sides of the plug can be tested at the valve rather than at widely separated tees where the bypass tubing enters the cable. All parts are tin-plated brass in accordance with standard practice for outdoor installation.

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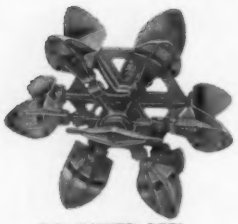

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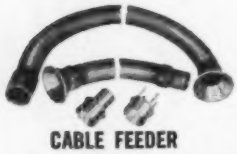

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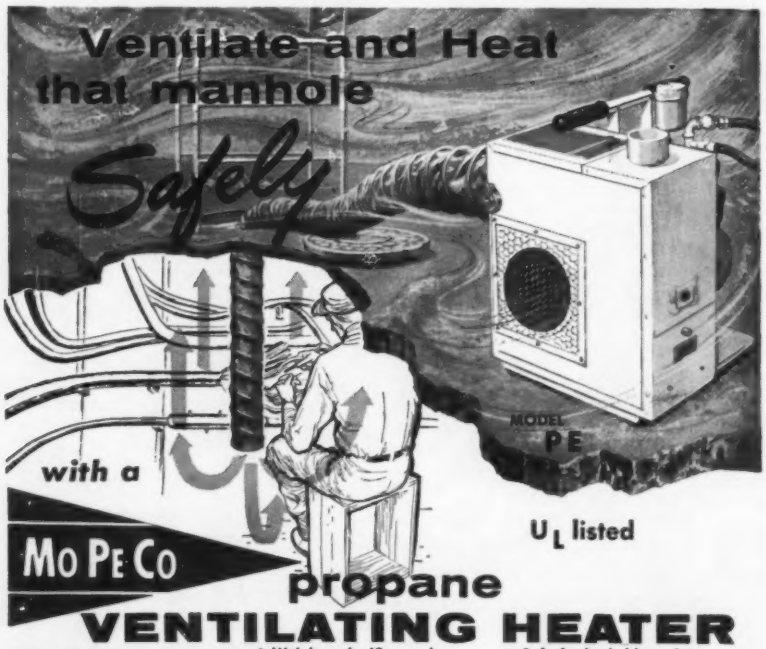
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FORT HUACHUCA

Continued from page 47

Huachuca Canyon where there was plenty of wood and water—a spot he later described as "an oasis in an otherwise hot, dry land."

Urged Permanent Post

Besides being an "oasis," Camp Huachuca was important in accomplishing the mission. It overlooked the wide expanses of the San Pedro Valley, through which the Apaches rode as they moved south from the San Carlos Reservation to a hideout in Mexico's Sierra Madre. After nine years of forays into the dusty, arid lands in pursuit of the elusive Redskins, the U. S. Cavalry brought peace to the valley. The climax came with the surrender of the renegade, Geronimo, in Skeleton Canyon in 1886.

"Camp" Huachuca became "Fort" Huachuca in 1882, confirming Captain Whitside's report to the War Department that "it is everything that could be desired for a permanent military post." Since then it has been used as a training ground for troops who fought in the Spanish American War, both World Wars, and in Korea.

The story of Fort Huachuca would not be complete without paying tribute to the young telegrapher of the U. S. Army Signal Corps whose name and memory are preserved in the fort's recreation center, Barnes Fieldhouse. William Croft Barnes, Private First Class, was one of the rugged signalmen who rode and fought beside the cavalrymen in the conquest of the West. Although their meagre mule-packed equipment included only signal flags, heliograph devices and at the scattered forts, telegraph equipment, they managed to "get the message through." Often this meant riding through hostile territory to repair telegraph lines damaged deliberately by Indians or by a capricious windstorm.

Received Congressional Medal

Private Barnes was the telegrapher at Fort Apache, high in the White Mountains (Sierra Blanca), during trouble with the Apaches in 1881. On Sept. 1, 200 to 300 Apaches had attacked the small garrison and help was sorely needed. Unable to get the mes-

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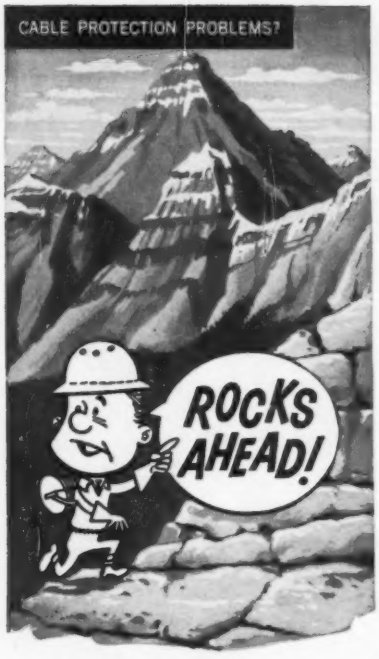

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sage through to Fort Thomas, 90 miles away, because of damaged lines, the young signalman volunteered to personally deliver the request for help.

He and a civilian scout, carrying identical messages, set out by different routes under cover of darkness. The scout was killed and Barnes had a close call when he ran into an Indian encampment at the Black River. He evaded capture by covering his horse's hooves with pieces of saddle blanket. Some time after crossing the river he met a troop of Cavalry enroute to Fort Apache. He entrusted his message to another courier for delivery to Fort Thomas and returned to his post with the troopers.

"For his gallantry in action in the attack by the Indians," and for his bravery in volunteering for the hazardous courier mission, Will C. Barnes was awarded the Congressional Medal of Honor. He left the Army in 1883 and became a well-known figure in state and national affairs. He made a name for himself in the cattle business in Arizona, served as a state legislator in both Arizona and New Mexico, and was with the U. S. Forestry Service for 22 years. He died in 1936 at the age of 78.

In 1960, as the Signal Corps celebrates its 100th anniversary, the traditions built by PFC Barnes and others like him, live on in the minds and hands of today's signalmen who carry out the mission to "Get the message through," with electronic devices instead of heliograph and semaphore flags.

Satellite Relay

On Dec. 18, 1958, the Atlas was successfully launched and placed in orbit by the Air Force carrying an Army communications package that became the first radio communications relay in outer space. Under the direction of the Advanced Research Projects Agency, the U. S. Army Signal Research & Development Laboratory, Fort Monmouth, N. J. developed with industry the space communications relay and the associated ground stations. The achievement—called "Project Score"—marked the first time that human intelligence was actively relayed through voice and teletypewriter signals by communication equipment in outer space. A goodwill message by President Eisenhower stressing the United States' wish for "Peace on Earth" was the first voice to be transmitted in space. Contributing companies who worked with Army scientists were Radio Corp. of America, Eagle-Pitcher Lead Co., Porter Bromfield, Convair-Astronautics Division of General Dynamics, Radiation, Inc. and R. F. Laboratories.

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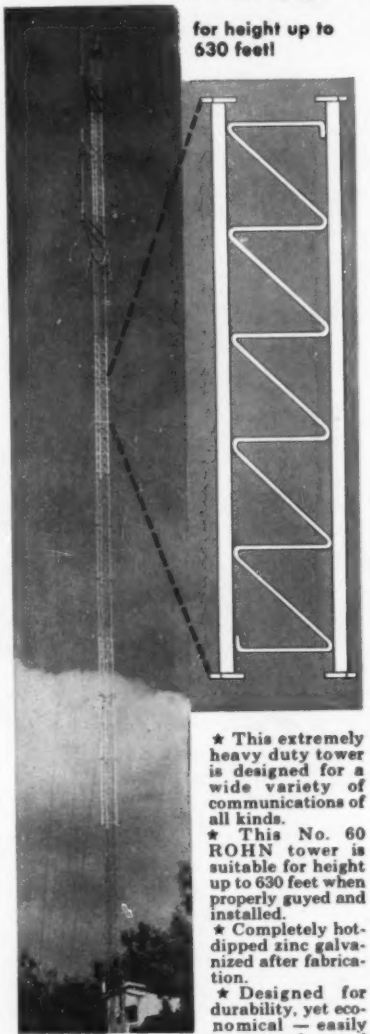

Shown here is a ROHN No. 60 tower installed to a height of 200 feet with 3 five-foot side arms, mounting antenna for police radio communications.

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SIGNAL DEPOT

Continued from page 54

radiation. These machines are fully automatic and the film reading is automatically recorded on an IBM card.

The Nucleonics Branches are continuously engaged in the repair and calibration of all types of radiac detecting instruments. To accurately calibrate such equipment, a 100-Curie source of Cobalt-60 is utilized. The 100-Curie source is deposited at the bottom of a 20-foot deep well. The source can be easily raised and lowered mechanically to achieve the desired intensities. But, to the extreme safety hazards in handling such a hot radioactive source, remote control devices, such as closed circuit monitor television and mechanical fingers, are used.

With regard to the Avionics Program, Depot Maintenance currently has the responsibility for electrically retrofitting Army aircraft on a prototype basis and in back-up support to General Depots. This means that each Maintenance Division must maintain a full capability to execute this mission.

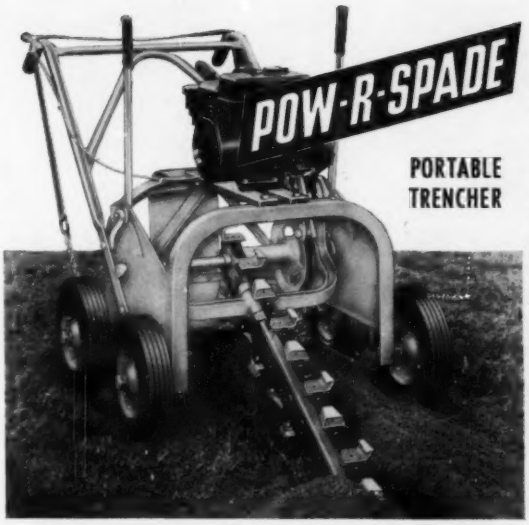
Along with the manned aircraft retrofit program is the program for servicing unmanned radio-controlled surveillance drones. Within the depot maintenance system, there is a highly trained nucleous of personnel and complete facilities for the testing and repairing of all types of ground to air control systems housed in pilotless aircraft.

Give Emergency Services

The Depot Maintenance Divisions provide a great variety of other necessary services that would otherwise not be available to them on a practical and economical basis from private industrial sources. These include practically the full range of services required on a quick-reaction or emergency basis. Not only are these services considered essential to peacetime operational needs, but they represent an established capability which can be rapidly expanded in the event of war.

The Machine and Sheet Metal Shops in the several divisions are fully equipped with machine tools which are both versatile and precise. The capabilities of these shops are virtually unlimited, permitting accurate fabrication of precision parts from metals, woods, and plastics.

The Graphic Arts Shops produce a great variety of metal identification and instruction plates, directional dials, and other related items that are placed on the equipments that are processed. These shops are now developing capabilities in etching printed circuits.



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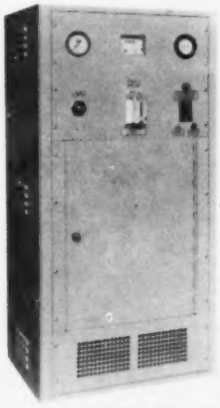

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NORTH WALES · PENNSYLVANIA

Maintain Frequency Standard

Standards Laboratories in each division maintain a primary frequency standard which is periodically calibrated against the standard frequency transmissions from the National Bureau of Standards. All test equipment and test devices are regularly certified to these standards.

Much of the new test equipment, as well as the equipments processed, is becoming transistorized. Depot Maintenance Divisions are now fully prepared to meet this new requirement.

Sacramento's Maintenance Division began training their repair personnel in transistor and printed circuit repair techniques in September 1958. One of the instructors from Sacramento was chosen last year to head up the team that was sent to the other depots to provide transistor training for their repair personnel.

In addition, the Maintenance Divisions provide other services and assistance, such as Repair Technical Training Teams to numerous allied foreign countries. Many commendations have been received from these countries expressing their gratitude for the thorough and fruitful technical assistance provided. As a part of the Military Assistance Program, on-the-job training is provided for foreign nationals in depot maintenance operations and techniques. To further support the field, Maintenance Division technicians reinforce Regional Maintenance Representatives throughout the world.

Skilled Personnel Problem

Army non-commissioned personnel are continuously in training to relieve the critical shortage of qualified officers and to provide men with good maintenance and management backgrounds to operate similar installations overseas.

As previously stated, the Depot Maintenance Divisions are now processing more and more small work orders with frequent additions and changes. As a result of this type of workload, retention of skilled personnel is a continually critical problem. For example, it is definitely not economical to retain these people during low workload periods, nor is it possible to release and rehire them to satisfy these changing workloads. The solution to this problem is found in the area of quick reaction projects, repair and return, and cross-servicing workloads to allow maintenance of the in-house capability so vital in the event of any emergency. A quick reaction project is, in general terms, defined as a requirement for fabrication of new equipment when procurement data does not exist and short due dates are involved. These projects fall into the following categories:

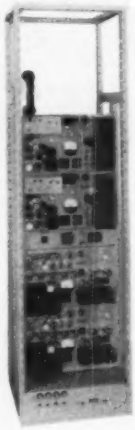
POINT-TO-POINT

→ MULTIPLEX ←

RADIO EQUIPMENT

• MILITARY • INDUSTRIAL

• COMMON CARRIER



Pictured above is a Budelman Type 14BW radio terminal with full RF standby as used in the Signal Corps AN/TSC-16 Communications Central.

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(1) Developmental items to test new field operations concepts.

(2) Stop-gap equipment required to support tests or other developmental items.

(3) One-time equipment required to support emergency operations pending receipt of standard equipment from industry.

Supplies Support to Others

Sacramento Signal Depot, for example, is authorized to provide quick reaction product support to the Army's Electronic Proving Ground at Fort Huachuca, and Tobyhanna and Lexington, to the U. S. Army Research and Development Laboratory, and the U. S. Army Signal Engineering Agency, respectively.

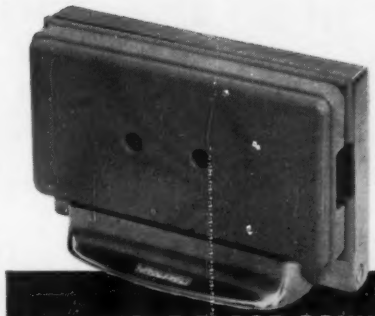
Field commanders, requiring depot maintenance support, need only contact the local regional maintenance represenative from one of the depot's Station Liaison Offices, since an important role of the regional maintenance representative is to provide a technical link between the Maintenance Divisions and the field. In addition, regional maintenance representatives have the authority and responsibility to provide staff assistance to field commanders in all areas of maintenance, supply, and fabrication. Upon request from the field, they arrange for the depots to overhaul any items requiring Fifth echelon repair. Field commanders are urged to contact the depots' Station Liaison Offices for quick solutions to their supply and maintenance problems.

The paramount objective of all depot maintenance activities is the furnishing of maximum service in minimum time and cost to the government. Specialized missions are assigned to the various maintenance divisions from both the logistical and strategic standpoints. In this regard, it is noteworthy that Sacramento is the only depot charged with the responsibility for executing all such missions. This is due, of course, to Sacramento's strategic West Coast location.

The great variety of services provided, many of which involve technical skills in scarce category, represent the U. S. Army Signal Corps' guarantee of a continual position of combat readiness. This is their answer to the problem of supplying Fifth echelon maintenance for all Signal equipment used by our Armed Forces.

World War I

Although Army Signal Corps troops comprised only about 4 per cent of the total troop strength during World War I, they provided communications far more extensive, reliable, and efficient than those known by any previous Army. While doing so, the Signal Corps sustained battle casualties second only to those of the Infantry by percentage: 301 killed and 1,721 wounded.



FLOOR-CON

. . . outmodes all other methods of telephone installation

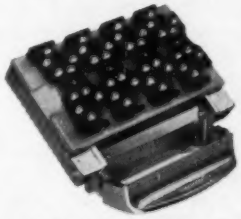
Model No. 104 — shown with standard telephone equipment — accommodates up to 8 No. 44-A Western Electric connecting blocks (4 on each side). Model No. 102 takes up to 6 (3 on each side), or if desired, the back of the Floor-Con can be used for external ringers, buzzers, or auxiliary equipment. This allows the desks and furniture to be free from all telephone equipment.

TELEPHONE FLOOR CONNECTOR

BEAUTY — clean lines and modern design

UNIFORMITY — provides standardized connections throughout

ECONOMY — phones can be completely installed prior to building occupancy



The fabulous FLOOR-CON allows phones to be connected entirely independent of office furnishings. Furniture may be moved or replaced without incurring expensive telephone changes. Gone are the clutter of equipment from desks and walls, and the needless marring of furniture.

Approved and specified by telephone companies, FLOOR-CON is used exclusively in many large buildings in business, industry and government. Attaches to all types of underfloor ducts and floor boxes, or fastens directly to the floor. Comes in four plated finishes to match the decor of the office.

FLOOR-CON — simplifies telephone connection service.

Pat. No. 2854166

For catalog information and prices, write —

FLOOR-CON 759-761 NORTH SPRING STREET • LOS ANGELES 12, CALIF. Telephone: MAdison 4-5400

CONDEX* MULTIPLE CONCRETE CONDUIT

Special fittings—miters—short lengths—expanded web sections available, also adapters to claytile, transite and fiber duct.

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Col. Concrete Products Co., Div. of Utah Concrete Pipe Co., Denver, Colo. Home Office: Ogden, Utah. Tel: EXport 9-1171
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Pre-Con of Quebec, Ltd., Montreal, Quebec, Canada. Home Office: Brampton, Ont. Tel: HUdson 1-3942 (Toronto)
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For information regarding CONDEX* Multiple-Duct Concrete Conduit, call or write your local producer, or the parent company.

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CONDEX **GAGNE ENTERPRISES, INC.**
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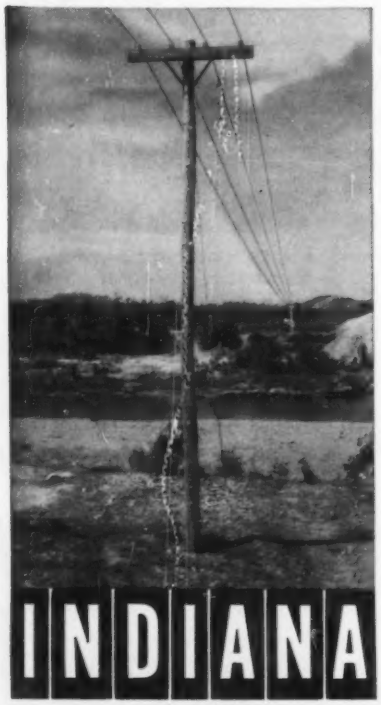
HTL-195
EXTRA HIGH-TENSILE TELEPHONE LINE WIRE
for low-cost Rural Lines

• Spans up to 600 feet in Heavy Loading, 650 feet in Medium Loading and 700 feet in Light Loading districts are possible where Crapo HTL-195 is employed. This extra long span construction results in marked savings in costs per mile of line. Pole structures can be reduced to a minimum. Fewer pole structures mean substantial savings both in materials and man-hours of labor. There is less hauling to be done, fewer holes to dig, less material to be handled, installed and connected.

Improved electrical qualities make practical typical subscriber loops of 14 to 15 miles with normal voltages and equipment. Also can be used for subscriber carrier.

Write for Engineering Manual No.TM-59



INDIANA

STEEL & WIRE CO., INC.
MUNCIE, INDIANA

MIDWEST RELAY STATION

Continued from page 58

Indian territory, the Signal Corps set up and operated a network of telegraph stations. It was these forerunners of the Midwest Relay Station and its companion units that took on the additional task of setting up a national weather service in 1870 when Congress authorized such a service. The relay stations of today also stand ready and able to assume greater burdens, as dictated by progress and circumstance.

Midwest Relay Development

Following are the roles played by the Kleinschmidt Division of Smith-Corona-Marchant and Automatic Electric in the development of this important weapon in the arsenal of communications.

The Midwest Relay Station was built at a cost of $10 million, and contains over $1.2 million of communications equipment designed and manufactured by Automatic Electric and Kleinschmidt under the supervision of the Signal Corps. Kleinschmidt, a pioneer in the field of printing communications, supplied the 600 reperforators, 400 transmitters, and 15 page printers which are employed in the complex system. Automatic Electric designed and produced the switching and routing equipment which makes possible the receipt, processing, and retransmission of messages on a fully automatic basis.

The communications center relays teleprinted messages "untouched by human hands," unless there is a procedural error or a garble occurring in the message. Such errors are automatically detected and the equipment is stopped for manual correction.

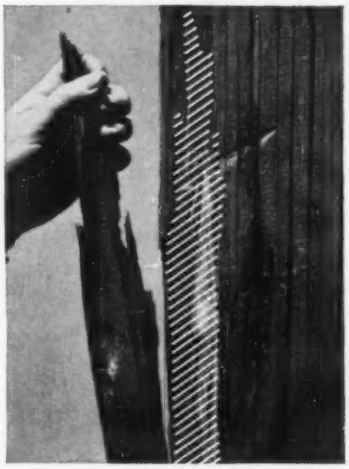
Relay System Operation

The system operates as follows. Incoming messages are electrically scanned; the precedence of the messages and the routing are recognized; the cross office and outgoing circuits are established; and the messages are then on their way to the distant called station automatically in a matter of seconds.

In this manner, for example, a message sent from the Pentagon to Fort Carson, Colo., through Midwest Relay may be appearing on the teletype in the Fort Carson Signal Office before the end of the same message has cleared the transmitter in Washington. A unique feature of the system is its ability to hold traffic temporarily to permit a high precedence message to clear through the center first.

Like the switching system itself, most of the teletypewriter equipment em-

SHELL ROT is often more subtle than this...



but POLE SPRAYERS can STOP IT in time!

"Shell rot" in the above-ground areas of older poles is a common form of decay—and can be dangerous. By the time it is visible to the eye it is a hazard to climbing personnel. The time to stop it is *before* it reaches that perilous stage. The surest, best *way* to stop it is by using POLE SPRAYERS men and methods!

POLE SPRAYERS *men* know their business thoroughly . . . crews are trained and experienced in the art of evaluating decay above ground—and then providing protection against its further progress. POLE SPRAYERS *method* is completely effective...it *flows* the preservative onto the wood, using specially-designed, low-pressure equipment—thus giving slow, thorough penetration of all *critical areas*, as well as keeping surrounding property free from possible damage. Fungus decay is stopped cold...reinfestation is prevented!

Find out—for greater personnel safety and for greater company profit—how efficient and economical a POLE SPRAYERS program can be. Write Pole Sprayers, Inc., 976 Ellicott Street, Buffalo 9, N. Y.

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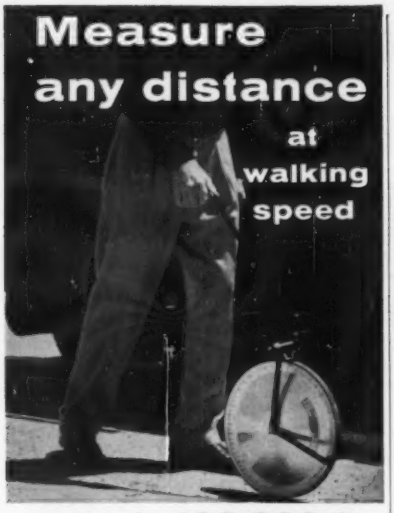

records 100,000 ft.
automatically!

It's So Easy to measure with a Rolatape ...and you save time on every estimating job...no tapes to wind, no helper is required. You get precision-accurate measurements every time.

Records Feet automatically and the accumulated total is always in full view.

Shows Inches, and Fractions of an inch. Wheel is calibrated in inches and fractions for quick easy reading.

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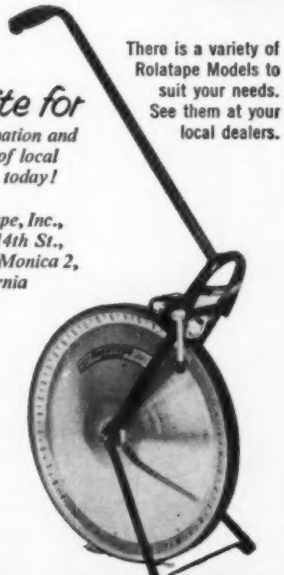
There is a variety of Rolatape Models to suit your needs. See them at your local dealers.

Write for information and name of local dealer today!

Rolatape, Inc., 1741 14th St., Santa Monica 2, California



Rolatape
Measuring Wheels

ployed in the station was designed specifically for use in the Relay Center.

Teletypewriter Components

The new line of teletypewriter components designed for these centers has the following features:

(1) All tapes produced in a center are both perforated and printed to permit operating and maintenance personnel to handle messages with complete ease at any point in the system. This is the first time that printing at speeds over 100 words per minute (wpm) has been possible in military high-usage equipment.

The Midwest Center at Ft. Leavenworth requires a cross-office speed of 115 wpm since practically all the lines feeding it are operating at 100 wpm. This advance from the usual 60 wpm is indicative of the trend toward higher speeds. This trend was responsible for the original requirement for automatic switching in the Army network that, 10 years ago, used manual switching at all relay points.

(2) In addition to the new speed requirement of 115 words per minute, a series of new devices was developed to fulfill the following needs:

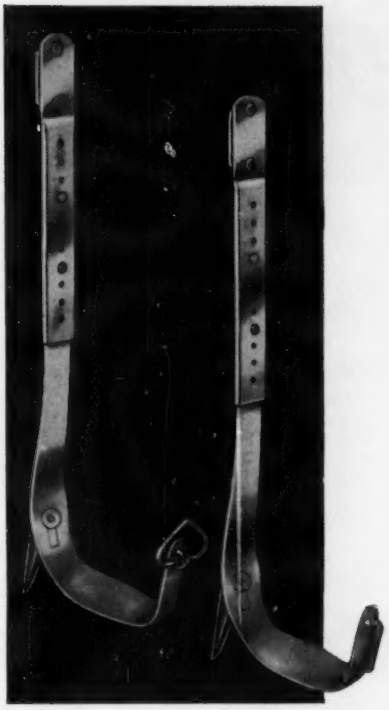
a) A markable transmitter-distributor was designed to do away with the need for sending "canned" information from tape loops which inherently are short-lived. This device, aptly nick-named the "remarkable td," sends sequential teletypewriter signals from a series of electrical markings supplied by a rotary stepping switch. There is no limit, of course, to the amount of material that can be transmitted in this way, nor to the switching possible between different groups of information.

b) A combination tape reader and transmitting distributor, with only one-inch spacing between reader and transmitting sensing pins, tape storage between reader and transmitter, special character sensing at both reader and transmitter, and five-wire output from the reader. The transmitter *can* presense a character to allow it to be stopped before the character is sent.

c) A teletypewriter unit consisting of a typing reperforator, a tape reader and transmitting distributor, a tape supply reel, a tape winder, a tape storage bin; all mounted to a common frame which in turn is mounted on a slide.

d) A unit similar to the above, with a mechanical tape-in-storage indicator which registers the number of feet of tape in storage between the reperforator and the tape reader, and closes contacts at 100, 90 and 50 feet of tape.

e) A tape puller on all reperforators, which operates an alarm in case the tape is not moving in a normal manner when the reperforator is receiving traffic. This causes an alarm when a torn-tape condition exists, the tape is jammed, the motor is turned off, or the machine is not functioning properly. This alarm, in conjunction with an open-line alarm, pro-



No. 1958-AR

NEW KLEIN
Replaceable Gaff Adjustable Climbers

These new Klein Replaceable Gaff Climbers assure maximum quality and safety. We recommend leg irons be replaced after three sets of gaffs have been used.

The easily replaceable gaff is held in position by a self-locking screw. Full impact is absorbed by the gaff and leg iron. No load is transmitted to the screw.

Adjustable to 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½ and 19 inches. Made in matched pairs, right and left. Available with triangular ring at ankle or riveted ankle loop. Aluminum finish. Every climber individually tested.

WRITE FOR BULLETIN 559

Bulletin 559, giving full information on Klein Replaceable Gaff Adjustable Climbers, will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

Mathias KLEIN & Sons
7200 McCORMICA ROAD • CHICAGO 45, ILLINOIS

TAKE A BIG STEP TOWARD SAFETY WITH DUO-SAFETY LADDERS

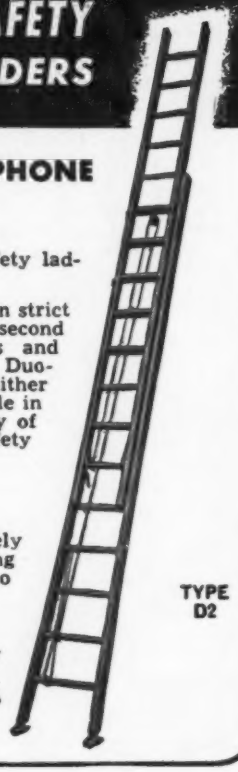
... CUSTOM DESIGNED FOR TELEPHONE MAINTENANCE WORK!

Here's one fine example of the many Duo-Safety ladders ideal for telephone maintenance work.

Type D — a truly great extension ladder built in strict accordance with safety regulations. Rungs are second growth hickory, reinforced with steel rods and equipped with special automatic locks and Duo-Safety's famous Safety Shoes. Made with either straight or parallel side rails, Type D is available in one, two or three sections — in a large variety of sizes. Write for free catalog on all Duo-Safety ladders.

IMMEDIATE DELIVERIES!

Duo-Safety ladders will be shipped immediately upon receipt of order! A planned stock-piling program assures really fast action — there's no delay the Duo-Safety way!



TYPE D2

For Information, Contact Your Supply House, or

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Wire for all type spinners
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STAINLESS STEEL
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LASHING WIRE

WE PRODUCE

The finest lashing wire possible because we believe . that lashing wire is one of the important parts of the cable plant, its duty being to hold the cable to the messenger for the life of the plant.

•

WE COIL

The best coil possible because we know that tangled or out of shape coils can cause spinning trouble, waste and delay

Write for Complete Information

CABLE SPINNING EQUIPMENT CO.
Topeka Kansas

vides maximum security for the circuit.

f) A selector magnet on the reperforator which is so sensitive that polar line relays are not required.

g) An incoming-line reperforator capable of sensing specified characters, which greatly simplifies control of multipoint circuits.

h) A special tape-reader in the cross office units, which reads certain characters directly on a single-wire-per-character basis; this greatly simplifies circuitry and operation of the switching equipment.

i) A magnetic, pulse-operated tape reader at the outgoing position, which in conjunction with a markable transmitting distributor provides a means of retransmitting a string of messages at the monitor position, or of reproducing a message in the monitor tape at a supervisory position in the office.

j) Other features are light weight, and low power consumption of all units.

(3) Without the above devices developed for Midwest and other military centers, fully-automatic switching as required by the Army would not have been possible. The Kleinschmidt Division is currently at work on even newer devices to meet the ever-present requirements for higher speeds, smaller packages, and complete commercial switching systems.

A few examples of these are transistorized photoelectric readers and printing punches for the Army Fieldata programs that have requirements for 300 words per minute, and party-line half-duplex and full-duplex switching systems for leasing to commercial customers.

Relay Center Versatility

One of the major features of the Relay Center is its versatility. In line with the objective of speeding up the flow of communications, the Midwest Relay Center is designed to operate at a speed up to 115 words per minute. The system, however, can also operate at 60 and 70 words a minute, thereby making it fully compatible with all other types of systems and equipment now in use.

The Midwest Relay Center represents an important step forward in the development of a modern, high-speed, automatic communications system to meet the increasingly complex requirements of the pentomic army. Developed as a project of the U. S. Army Signal Corps, the large communications complex at Fort Leavenworth adds significantly to the Army's global communications capability and to the security of the country.

Automatic Electric Co., subsidiary of General Telephone & Electronics Corp., designed and produced the switching equipment which makes possible the re-

ceipt, processing and retransmission of messages by fully automatic methods. As has been mentioned, most of the Kleinschmidt equipment was designed with special features to improve and assist in automatic operation. The marriage of the Kleinschmidt teletypewriter equipment with Automatic Electric's switching equipment has produced a teletypewriter switching system meeting all the exacting requirements of the U. S. Army Signal Corps.

The unique feature of this installation is that all messages are acted upon as soon as received and are reproduced and sorted into a cross-office pool according to six degrees of precedence and the outgoing channel required to forward the message. This insures that no messages are held at the incoming positions and a high-precedence message is always capable of being processed immediately.

Furthermore, multiple-address messages are processed into this cross-office pool so that as many tapes as necessary to forward the message to all addresses are prepared without delay, simultaneously. Messages are transmitted from the cross-office pool to the outgoing channels in strict accordance to the precedence of the messages in storage for that channel. This provides for full utilization of circuits, for the channel will always be utilized if there is a message for that channel in the station.

The cross-office pool consists of cross-office units, multiple-address cross-office units and intercept units. None of these units are associated normally with any incoming line but are connected with one under the control of the Director as required. The cross-office unit and the multiple-address cross-office units consist of a reperforator, a reader transmitter and tape storage.

The transmitter of the cross-office units is normally not connected to any outgoing channel, but is switched to outgoing channels by the Director. The incoming side of the cross-office units is also switched to the transmitter of the multiple-address cross-office unit as required by the multiple-address processing equipment to prepare as many tapes as necessary to forward the message to all addressees. The intercept unit consists mainly of a reperforator for producing a tape which can be acted on manually and is associated with an incoming line also by the Director.

The equipment also transmits a new start-of-message indicator and a new channel number for each outgoing message and deletes all but the last channel number in the message so that each message will be forwarded with only two sets of message numbers—the sent number and the received number.

Announcing...

the NEW!
IMPROVED
BUS BROWN
MODEL 468R 12 HP
TRENCHER!
(3" to 12" wide trench)

The digging chain and cutters have proved to be unequaled in performance and durability.
Drives on all 4 wheels while digging; rear wheels when in transport gear.
Boom can be raised to upright position.
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DESIGNED FOR MAXIMUM EFFICIENCY AT MINIMUM COST!

MAXIMUM EFFICIENCY
The Model 468R 12 HP Trencher is small, compact, rugged and easy to maneuver. It is designed to give you maximum efficiency due to faster digging speed.

MINIMUM COST
Only one operator is needed . . . digging speeds are greater . . . and the simplicity and compactness of design lowers maintenance cost, making your trenching less expensive.

Write today for complete information!

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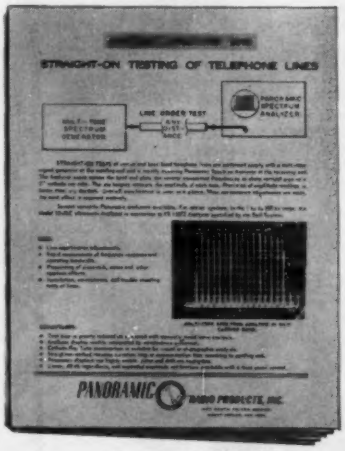
WOODBINE, IOWA



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Send today for Panoramic's NEW Application Note "Straight-On Testing of Telephone Lines"

Contains complete information on ONE-STEP LINE EQUALIZATION TESTS, with multi-tone straight-on method and a rapid scanning Panoramic Spectrum Analyzer.

dependable CERTIFIED SPECIFICATIONS for accurate data

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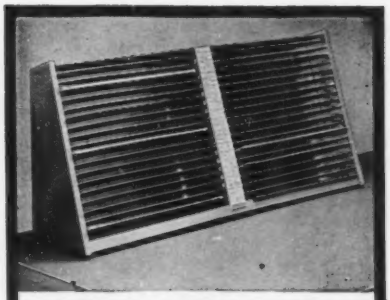


Trouble Recorder Card Rack

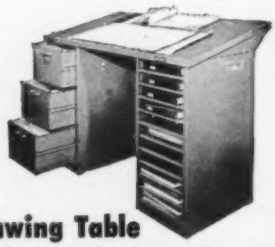
For fast orderly sorting of Trouble-Recorder cards, has 38 card slots in two banks with index strip between. Base is 38" by 8". Height 15". No. D30225-1.

Telephone Office Equipment

to lighten your work and improve efficiency

Work Bench

For repair, assembly, test and paper work. Top drawer divided into 24 compartments for parts and tools. Large file drawers are for circuit drawings. 54" x 25" top covered with masonite. Height 36". Drawers may be inserted from back to reverse position of kneehole. No. D29978-3.



Drawing Table

For circuit drawing in crossbar offices, provides central location for reference material. Masonite top is 30" x 60". Height 36" at front, 42" at rear. Three large file drawers at left for drawings. Eleven shelves at right are 2½" high, 14" wide, 18" deep for sketches, sequence charts, book type SD sheets, trunk serials, etc. No. D30326-1.

Color of all units: Baked-on gray enamel unless otherwise specified.

TWIN POST
Neubauer
MANUFACTURING CO.
517 LOWRY AVENUE N.E.
MINNEAPOLIS 18, MINN.

High-Precedence Messages

Messages of the three highest degress of precedence will automatically break in on the transmission of a message of lower precedence. A cancellation and termination sequence is automatically added to the message broken into and the line is made available to the high precedence message. Alarms indicate a message has been "busted" and a minor manual operation is required for retransmission of this message.

Incoming and outgoing line transmission may be at any of the three standard speeds of 60, 75 and 100 words per minute. Any switching center of this type can be used with all three speeds simultaneously.

Since all messages are acted upon immediately at the incoming line and switched to a cross-office pool, it is only necessary to transmit the messages to the cross-office pool at slightly higher speed to make up for the switching time. This greatly reduces maintenance of equipment.

Full flexibility of the military plan for routing indicators is provided and routing assignment is made by single conductor pin, jack patch cords, thus providing immediate reassignment.

Any number of channels may be used to any given destination, and traffic is distributed automatically and approximately equally to all channels of the group. A manual alternate-routing patch panel is provided which permits temporary reassignment of traffic in storage to an alternate channel.

Maximum Message Security

The system is designed for maximum security of messages and is replete with alarms for any abnormal condition. Messages are checked to insure that start and end of message sequences are passed in the proper order. Messages received from a station with a routing indicator, which, when translated, would route the message back to that station, are automatically sent to an intercept position.

All messages, which for any reason cannot be acted upon properly, are also sent to an intercept position for manual handling.

Manual forwarding positions are provided for inserting messages into the system. A control panel is provided to permit an operator to select any desired outgoing channel for seizure in accordance with precedence regulations.

Radio Broadcast

The first Signal Corps radio broadcast for the general public was a service from Trinity Church in Washington on Aug. 24, 1919.

GHO special services to telephone companies

More than 60 years of service in every phase of telephone operations and construction back up Gustav Hirsch Organization, Inc., in the following special services:

— Appraisals of communication system properties
— Representation of telephone utilities in rate matters
— Preparation of depreciation and plant replacement schedules
— Years-ahead master planning of telephone service
— Preparation of Pro-Forma operating statements to aid in financing expansion and rehabilitation programs

G H O
GUSTAV HIRSCH ORGANIZATION, INC.
COLUMBUS 12, OHIO
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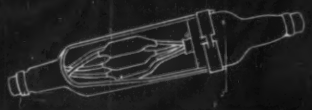
ROBERTSON
Splice & Connector Cases



reduce splicing time from hours to minutes

Robertson Cases provide an efficient system for splicing and assembling of wire products and lines. The sleevelike design is easily joined and separated providing a case for smaller splices and cases. A beryllium copper clamping ring seals the case making it moisture and dust proof.

Made of polyvinyl chloride; tensile strength 2500 psi; dielectric strength 400 volts/mil thickness. Resists organic and inorganic acids and alkalis, fungus. For temperatures 250 F. to -65 F. Available in other materials to meet your specifications.

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AVNET•4180 Kettering Blvd., Dayton 39, Ohio- AX 8-1458
AVNET•2728 N. Mannheim Rd., Melrose Park, Ill.- GL 5-8160
AVNET•1262 N. Lawrence Sta. Rd., Sunnyvale, Cal.- RE 6-0300

Courts and Commissions

Hear More on Ohio General's Toll Complaint Against Bell

The Ohio Public Utilities Commission on June 7 and 8 resumed hearings on General Telephone Co. of Ohio's complaint seeking an increase in compensation on message toll telephone service interchanged with Ohio Bell Telephone Co. (TELEPHONY, May 14).

The amount of compensation sought by General of Ohio was determined in a study based on procedures in the Separations Manual of the United States Independent Telephone Association.

Direct testimony was previously presented in hearings on Apr. 19 and 20. The June 7-8 sessions consisted of cross-examination of General of Ohio's president, Clare E. Williams; operating vice president, F. W. Hamper; chief engineer, Forrest R. Stroud Jr.; and Richard L. Ohlson of General Telephone Service Corp., and Mervin H. Alexander, USITA Toll Engineer. W. R. Jarmon, chairman of the USITA Toll Compensation & Settlements Committee, attended the hearings.

The commission denied a motion by John Robert Jones and Sidney Griffith, attorneys for General of Ohio, requesting reconsideration of the commission order for a loop mileage study of General of Ohio's exchange circuit plant. The commission indicated that the mechanics employed by Ohio Bell in making such a study should be made available to General of Ohio.

The commission previously had granted a motion made by Ohio Bell for a mileage study. However, the commission, in its order, reserved the right to rule upon the admissibility, materiality, or weight, if any, to be given the results of such a study if offered as evidence by Ohio Bell.

Resumption of the hearings is tentatively scheduled for July 26. At that time Bell attorneys will cross-examine Neal C. Hasbrook, secretary-treasurer of the California Independent Telephone Association, and present direct testimony from Ohio Bell.

High Court Reverses Neb. Body's Boundary Decision

The Nebraska Supreme Court on June 3 reversed a decision of the Railway Commission, of July 18, 1958, which established boundary lines between the Lincoln exchange of The

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Lincoln Telephone & Telegraph Co. and the Martell exchange of the Capital Telephone Co., Hickman. Boundaries were established by the commission at the time the Capital company purchased the properties of the Martell company (TELEPHONY, July 12, 1958).

Two of the appellants in the case were farmers formerly on the Lincoln exchange who were transferred to the Martell exchange. The other was an elevator company which formerly had both Lincoln and Martell service, and for which the Martell service was ordered removed.

All three contended that they had a right to be served on exchanges as they were before the boundaries were established. This contention was upheld by the supreme court.

Form Ohio Holding Company To Acquire Independents

A new corporation, Mid-Continent Telephone Corp., with an authorized 2 million shares of common stock, has been incorporated under the laws of the state of Ohio. It is anticipated one of the major purposes of the new holding company will be the acquisition of the stock and other securities of operating telephone companies. The headquarters will be in Elyria.

Officers of Mid-Continent are Weldon W. Case, president; Robert J. McNulty, treasurer; and George C. McConnaughey Jr., secretary. Mr. Case is also president of The Western Reserve Telephone Co., Hudson, O., and The Elyria (O.) Telephone Co., and Mr.

Convention Calendar

1960

Association	*Date*	*City*	*Hotel*
Alaska	Aug. 15, 16 and 17	Sitka	Elks Club Rooms
Tennessee	Sept. 7 and 8	Nashville	Hermitage
Arkansas	Sept. 12 and 13	Hot Springs	Velda Rose Motel
Michigan	Sept. 12 and 13	Mackinac Island	Grand
Rocky Mountain	Sept. 14, 15 and 16	Denver	Hilton
West Virginia	Sept. 19, 20 and 21	Morgantown	Morgan
Nevada	Sept. 21, 22 and 23	Ely	Nevada
New England	Sept. 25, 26, 27 and 28	Bretton Woods, N. H.	Mt. Washington
North Carolina	Oct. 3 and 4	Pinehurst	Carolina
USITA	Oct. 9, 10, 11 and 12	Chicago	Conrad Hilton
South Carolina	Oct. 24 and 25	Clemson	Clemson House
Virginia	Oct. 27 and 28	Roanoke	Roanoke
Oklahoma	Nov. 9 and 10	Oklahoma City	Skirvin
Georgia	Nov. 9 and 10	Atlanta	Biltmore
Alabama	Nov. 14 and 15	Birmingham	Thomas Jefferson
Florida	Nov. 28 and 29	Jacksonville	Robert Meyer

*Joint Convention

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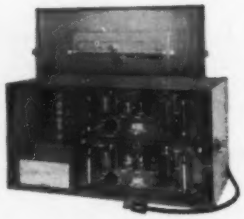
The 455A Amplifier is a transistorized repeater type amplifier wrapping up a compact package of gain for telephone circuit use. Incorporates the gain, power handling capacity, frequency response, plug-in features in the physical size of vacuum tube type repeater. Ten repeaters go in the same standard rack mount used for vacuum tube types. Operates on 48 volt DC @ 22 ma. Since it is transistorized no 130 volt supply is needed. For details, write for Altec Lansing Bulletin #13385.



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A subsidiary of Ling-Altec Electronics, Inc.

McNulty is comptroller and assistant treasurer of the Elyria company.

Mr. McConnaughey is a practicing attorney with the law firm of McConnaughey, McConnaughey & Stradley, Columbus.

Directors of Mid-Continent Telephone Corp., in addition to Mr. Case, are R. J. Fitch, president of Elyria Savings & Trust Co.; George C. McConnaughey Sr., a practicing attorney of the law firm of McConnaughey, McConnaughey & Stradley, and former chairman of the Federal Communications Commission; and Harold N. Wilson, vice president of The Ohio Co., an investment banking firm of Columbus.

It is expected that a registration statement covering the business and plans of Mid-Continent will be filed with the Securities & Exchange Commission shortly.

GT&E Proposes to Buy Middletown, N. Y. Company

General Telephone & Electronics Corp. has contracted to purchase the controlling interest in Orange County Telephone Co., Middletown, N. Y., as a preliminary step toward the ultimate acquisition of that company's operations, it was announced on June 10 by Donald C. Power.

The contract is subject to the approval of Orange County Telephone Co. stockholders at a special meeting on June 28, and is also subject to the approval of the New York Public Service Commission.

Orange County Telephone Co. serves more than 17,000 telephones in nine exchanges. These facilities are 100 per cent dial-operated, and are regarded as among the most modern in the telephone industry. The company's operating territory is adjacent to General Telephone exchanges in Port Jervis, N. Y., and vicinity.

It is presently contemplated that subject to New York Public Service Commission approval, the operations of the Orange County company would ultimately become a part of General Telephone Co. of Upstate New York, Inc. Meanwhile, the Orange County company would continue to operate as at present. Messrs. Chappell and Fancher would retire from active management but would continue on the board of directors. No other personnel changes are now anticipated.

OK Transfer, Plans for Improving 4 Kan. Exchanges

The transfer of Bennington, Barnard, Beverly, and Tescott exchanges from the United Telephone Co. of Kansas, Inc., Abilene, to the Twin Valley Telephone Co., Miltonvale, has been author-

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ized by the Kansas Corporation Commission, it was reported on May 28.

The commission also approved an REA loan to the Twin Valley company for modernization of the exchanges which the company plans to cut over to dial "sometime next year."

The Twin Valley company also operates exchanges at Green and Miltonvale.

Texas T&T Exchange Gets New EAS Dial Rates

J. B. Swink, general commercial and traffic manager of the Texas Telephone & Telegraph Co., Corsicana, has announced that W. G. Johnston, district manager of the north-central district, has received approval from the Palmer city council for increased dial rates which, it was said, will allow his company to proceed with the enlargement program at Palmer.

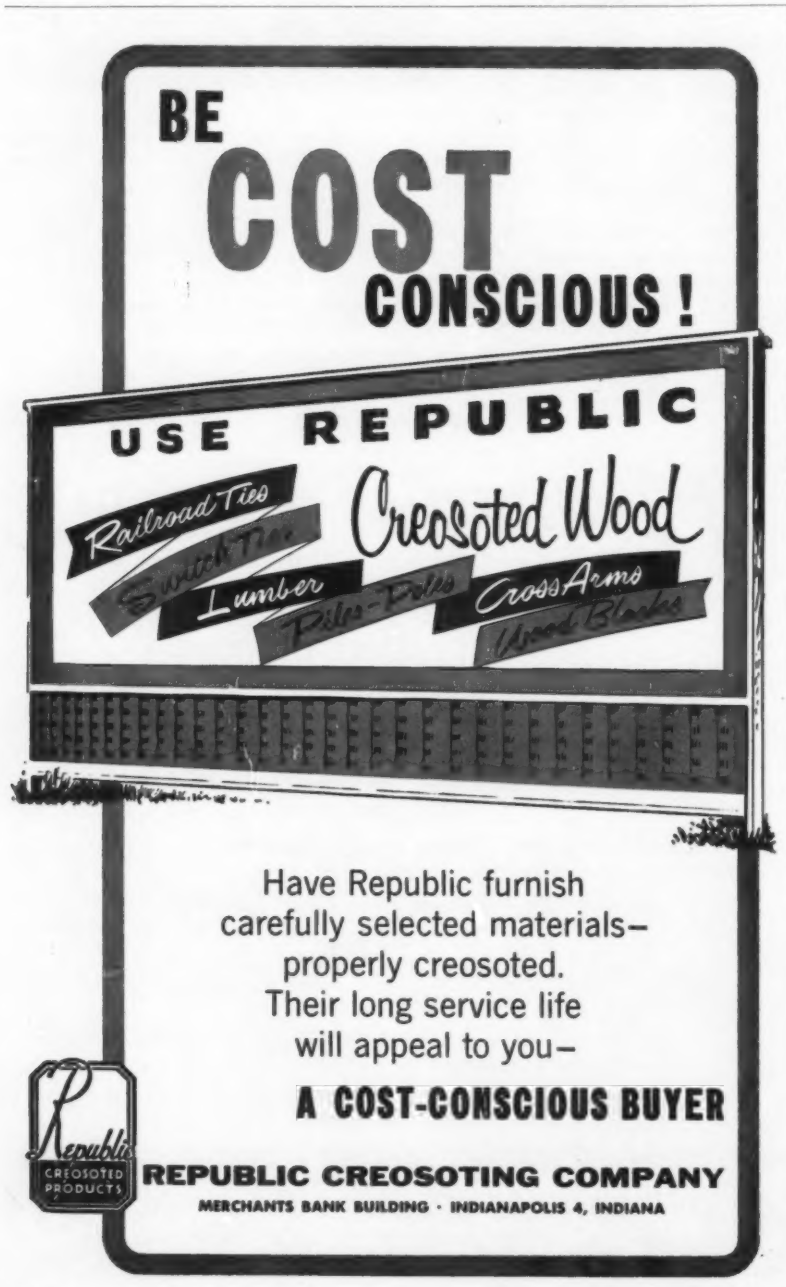
Palmer is now being furnished dial service, but the company will build a new building and install new central office equipment.

Palmer will have extended area service to Ferris, the toll center.

Mr. Swink listed the following rates as present and new increased dial rates.

	Present	*New*
One-party business	$5.00	$8.70
Two-party business	4.25	7.80
Four-party business	4.00	7.20
Business extension	1.50	2.00
Rural business	4.50	8.00
One-party residence	3.50	5.40
Two-party residence	3.00	4.50
Four-party residence	2.50	4.00
Residence extension	1.00	1.50
Rural residence	2.75	4.50

The Palmer exchange is now serving 222 customers. With the new installation, additional customers will be able to be served, it was stated.



OK Scaled-Down Increase To General of Indiana

The Indiana Public Service Commission on May 27 granted a rate increase to the General Telephone Co. of Indiana amounting to $1,993,581, or 62½ per cent of the company's request. The raise was scaled down by the commission from $3,194,255, the amount asked in the company's petition (TELEPHONY, May 23, 1959).

The Indiana commission did not set exact rates for all the General company's exchanges, though it did set top rate classifications for Fort Wayne, Terre Haute, and a few others.

The company was directed to file tariffs on the new rates that would yield the over-all annual gross increase of $1,993,581, "as soon as reasonably possible," the new rates to be effective on commission approval.

According to the commission, the order directs the company to file a reclassification of exchanges showing rates which will raise the authorized net operating income.

While Fort Wayne, Terre Haute and a few other exchanges will have increased rates, rates at other exchanges will need to be reduced to meet the requirements of the order.

New York Company Asks Increase for Improvements

The Oswego County Telephone Corp., Fulton, according to announcement by the company president, William G. Tumbridge asked the New York Public Service Commission on June 2 for a rate increase, to become effective on July 1.

Mr. Tumbridge stated that this was the first increase for Oswego County's subscribers since 1951, when the company served 6,400. Today, the company is serving more than 10,000 subscribers, and operating costs are said to have nearly doubled in the last nine years.

The company president pointed to increased cost of money borrowed for

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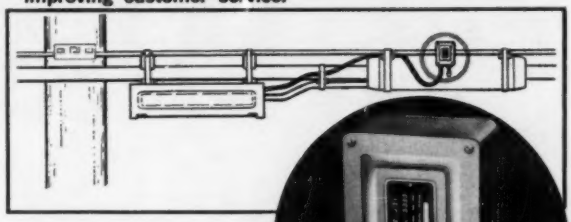

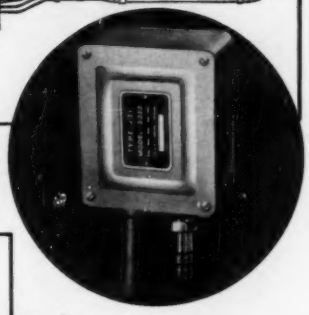

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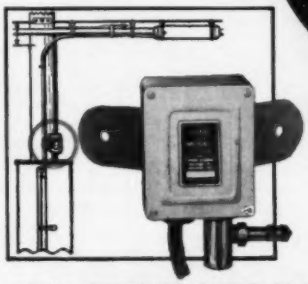

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Factory Setting .....2 ±¼ PSI on falling pressure
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Electric Rating .....0.01 amp 100 V DC
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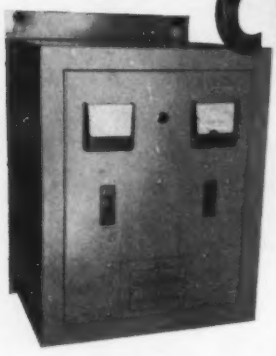

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FOR DIRECT EARTH BURIAL INSTALLATION.
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NOTE: Galvanized steel cases and stub assemblies are completely covered with plastic tape to protect metal from electrolysis or other soil corrosive agents.

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- PLASTIC STUB ASSEMBLIES ARE ARMOURED AND SEALED IN THERMOPLASTIC COMPOUND TO INSURE PROTECTION FROM MOISTURE.

These assemblies are equipped with voice frequency coils, Types C632 (88 MH) and C638 (44 MH) coils are for subscriber loading, and Types C642 (88 MH) and C641 (44 MH) coils are for use on quadded inter-office and toll cables. Special coils can be made to meet other requirements.

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expansion, improvement and modernization of the system, and the cost of installing DDD equipment, now in progress, as reasons for the increase.

The new schedule of rates asked by Oswego County Telephone Corp. is as follows:

One-party residence	$ 5.75
Four-party residence	3.75
Rural residence	4.25
One-party business	10.00
Two-party business	8.00
Rural business	6.25

General of SW Gets Raises For Two Texas Exchanges

The following rate increases became effective in Texas exchanges of the General Telephone Co. of the Southwest, San Angelo, during the month of May.

	Old	*New*
Roaring Springs, dial, 114 stations.		
One-party business	$9.00	$11.00
Two-party business	7.50	9.00
One-party residence	5.00	6.00
Two-party residence	4.25	5.25
Wheeler, dial, 500 stations.		
One-party business	10.00	11.00
Two-party business	8.00	9.00
One-party residence	5.25	5.75
Two-party residence	4.50	5.00
Four-party residence	4.00	4.25

Hear Rate Schedule Requests For Two Neb. Companies

The Nebraska Railway Commission was to have held a hearing on June 10 on an application of the Rodeo Telephone Membership Corp., Burwell, for a certificate of convenience and necessity to serve additional territory, and for a schedule of rates.

On June 9 a hearing was held on an application of the Nebraska Telephone Co., Blair, for permission to make adjustments in rates and charges.

Ask Bond Sale in Neb.

On June 14, the Nebraska Railway Commission was to have heard the application of the Bertrand Telephone Co. for authority to issue and sell first mortgage 6½ per cent sinking fund bonds.

Wis. Company Secures Raise

The Almond Telephone Co. on May 31 was authorized by the Wisconsin Public Service Commission to increase rates so annual revenue will rise $2,816 (TELEPHONY, Apr. 23). The company serves 342 customers.

Incorporate in Neb.

Articles of incorporation were filed on June 7 by the Clinton (Neb.) Telephone Co., Inc., a non-profit company near Gordon. Incorporators were Willard Hess Jr., Harold Hood, Max Elder, Gerald Tausan, Sam Benson, Vern

Swick, Mary Swick, and the Retzlaff Grain Co., Inc., Clinton, with mailing addresses at Gordon.

Approve New Service Rates For South Dakota Company

The South Dakota Public Utilities Commission, it was reported on May 28, approved a schedule of rates for the Midstate Telephone Co., Kimball, to apply to its new Fort Thompson service, as follows:

One-party business	$9.25
Two-party business	8.25
One-party residence	6.00
Two-party residence	5.50
Four-party residence	5.00

Ask Sale-Purchase, and Financing OKs in Missouri

A joint application was filed before the Missouri Public Service Commission on June 8, and hearing set for June 23, by Leo J. and Melba Blinzler to sell the Wentworth Telephone Co.; and by W. W. Coleman, W. E. Gault, and A. D. Moore, to purchase the Wentworth company.

•

Southwest Dial, Inc., Cassville, filed an application for authority to issue its promissory note to Earl C. Ewer for long-term financing in the purchase of the capital stock of the Concordia Telephone Co.

Grant Increase in Wis.

The Wisconsin Public Service Commission on May 28 authorized a rate increase for the Utica Farmers Mutual Telephone Co., Gays Mills, amounting to $2,729 (TELEPHONY, Apr. 30).

Seek Rate Relief in Wis.

The Wisconsin Public Service Commission on June 14 was to have heard the application of Shell Lake Telephone Co. for authority to increase rates.

Army Signals for Marines

During the long Union campaign to capture and control the Mississippi River from New Orleans to Vicksburg, from March to July in 1862, a Federal Army signal party served actively with the Marine Brigade and with elements of the Federal Navy. After the fall of New Orleans in April of 1862, the signal party continued such effective action that it was cited for service under fire during the attack and fall of Memphis in June of 1862 and the attack and fall of Vicksburg in July of 1863.

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One-party residence	5.00	6.00
Two-party residence	4.25	5.25
Wheeler, dial, 500 stations.		
One-party business	10.00	11.00
Two-party business	8.00	9.00
One-party residence	5.25	5.75
Two-party residence	4.50	5.00
Four-party residence	4.00	4.25

Hear Rate Schedule Requests For Two Neb. Companies

The Nebraska Railway Commission was to have held a hearing on June 10 on an application of the Rodeo Telephone Membership Corp., Burwell, for a certificate of convenience and necessity to serve additional territory, and for a schedule of rates.

On June 9 a hearing was held on an application of the Nebraska Telephone Co., Blair, for permission to make adjustments in rates and charges.

Ask Bond Sale in Neb.

On June 14, the Nebraska Railway Commission was to have heard the application of the Bertrand Telephone Co. for authority to issue and sell first mortgage 6½ per cent sinking fund bonds.

Wis. Company Secures Raise

The Almond Telephone Co. on May 31 was authorized by the Wisconsin Public Service Commission to increase rates so annual revenue will rise $2,816 (TELEPHONY, Apr. 23). The company serves 342 customers.

Incorporate in Neb.

Articles of incorporation were filed on June 7 by the Clinton (Neb.) Telephone Co., Inc., a non-profit company near Gordon. Incorporators were Willard Hess Jr., Harold Hood, Max Elder, Gerald Tausan, Sam Benson, Vern

Swick, Mary Swick, and the Retzlaff Grain Co., Inc., Clinton, with mailing addresses at Gordon.

Approve New Service Rates For South Dakota Company

The South Dakota Public Utilities Commission, it was reported on May 28, approved a schedule of rates for the Midstate Telephone Co., Kimball, to apply to its new Fort Thompson service, as follows:

One-party business	$9.25
Two-party business	8.25
One-party residence	6.00
Two-party residence	5.50
Four-party residence	5.00

Ask Sale-Purchase, and Financing OKs in Missouri

A joint application was filed before the Missouri Public Service Commission on June 8, and hearing set for June 23, by Leo J. and Melba Blinzler to sell the Wentworth Telephone Co.; and by W. W. Coleman, W. E. Gault, and A. D. Moore, to purchase the Wentworth company.

•

Southwest Dial, Inc., Cassville, filed an application for authority to issue its promissory note to Earl C. Ewer for long-term financing in the purchase of the capital stock of the Concordia Telephone Co.

Grant Increase in Wis.

The Wisconsin Public Service Commission on May 23 authorized a rate increase for the Utica Farmers Mutual Telephone Co., Gays Mills, amounting to $2,729 (TELEPHONY, Apr. 30).

Seek Rate Relief in Wis.

The Wisconsin Public Service Commission on June 14 was to have heard the application of Shell Lake Telephone Co. for authority to increase rates.

Army Signals for Marines

During the long Union campaign to capture and control the Mississippi River from New Orleans to Vicksburg, from March to July in 1862, a Federal Army signal party served actively with the Marine Brigade and with elements of the Federal Navy. After the fall of New Orleans in April of 1862, the signal party continued such effective action that it was cited for service under fire during the attack and fall of Memphis in June of 1862 and the attack and fall of Vicksburg in July of 1863.

Teletypewriter Relay

At Fifth Army headquarters in Chicago, on Dec. 17, 1952, the first automatic teletypewriter relay system was established by the Army Signal Corps.

the DAVIS PUP TRENCHER

IS POSITIVELY SELF-PROPELLED

trenches while you do other work!

The portable, self-propelled Davis Pup Trencher has proven itself as the most valuable trenching tool available for assignments from 2" to 3" wide to 36" deep or 4" wide to 18" deep. Users have reported it has paid for itself on the very first job.

It is positively driven by a simple, six-speed winch mechanism that pulls it down the line you want dug. Since it doesn't require constant supervision, you are free to take care of other work on the job — such as prepare pipe or cable for the trench. It disturbs a minimum of turf so backfilling is easy.

The Davis Pup has quality features throughout, but it is still priced less than comparable trenchers. Compare it for performance, quality, and price. See if you don't agree that pound for pound, dollar for dollar, it's your best trenching buy!

and if you need to go larger — the NEW DAVIS T-66 fills the bill!

This amazing trencher features positive traction, hydraulic variable speed drive, accurate speed control, hydraulic boom control, pre-loaded shock absorbing boom, and convenient — virtually effortless — operation. Digs 3" to 4" wide to 66" deep or 12" wide, 30" deep and varying depths and widths in between. Compact design with 1350 lbs. total weight; only 37" wide. Has well-designed backfill blade attachment, two-speed drive with instant forward or reverse, and many other features. Ask about its 90-day unconditional guarantee!

the PERFECT VEHICLE FOR TRANSPORTING TRENCHERS AND SUPPLIES

THE DAVIS HUSTLER

This 2000-lb. capacity utility trailer was especially designed for the T-66, but it has a wide range of uses. Deck is 48" x 84". It has a low center of gravity and provides load equalization regardless of load distribution.

DAVIS MFG. INC.

1515 South McLean Blvd., Wichita 13, Kansas

Please send me literature and tell me the name of the distributor for the Davis Pup____Davis T-66____Davis Hustler Utility Trailer____

NAME_____

ADDRESS_____

TOWN_____ STATE_____

P-60-2

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established in 1926

FULLY EQUIPPED to FURNISH:

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Cable splicers

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Station installers

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From
An Old Friend
to
An Old Friend

Happy
100th Anniversary
to the
U.S. Army
Signal Corps

FREY MACHINE PRODUCTS CO.
Richboro, Pa.
Jack Frey — George Frey

National Yellow-Page Space Available from One Contact

Advertisers can now buy national Yellow Pages advertising in the United States and Canada simply by placing a single order through one contact, it has been announced in Chicago by The Reuben H. Donnelley Corp.

The former method required advertisers or their agencies to negotiate contracts with individual telephone companies or their directory publishers. There are more than 4,000 directories with over 90 million circulation.

The new service enables advertisers to support their Yellow Pages trade mark representation with creative selling messages.

The announcement was made at a series of live, dramatic presentations on June 7 and 8 before Chicago's top advertising executives. The show, which uses seven actors, was sponsored in Chicago by the Donnelley organization. Produced by the Bell System, the presentation has been given in New York City, Cleveland, Baltimore, Boston, Philadelphia, Atlanta, Indianapolis, Detroit, Minneapolis, Milwaukee, San Francisco and Los Angeles.

"The new service works very much like advertising in regional editions of national magazines," according to Charles Ruppman, national Yellow Pages sales manager of The Reuben H. Donnelley Corp.

He said that advertisers can now place space in as many directories as they want through one contact, signing one contract, and receiving just one monthly bill.

Mr. Ruppman also pointed out that the National Yellow Pages Service is commissionable to advertising agencies.

The service also offers marketing data, promotional assistance, merchandising help and local tie-in support. Ads are scheduled and inserted, and a complete set of tear sheets returned to the agency. All this is done through one national Yellow Pages service representative.

The new service will be supported by black and white spreads in the business and advertising press, including: *Advertising Age, Printers' Ink, Business Week, Wall Street Journal* (national edition), *Dun's Review & Modern Industry, Harvard Business Review, Media/Scope, Nation's Business, Sales Management,* and *Industrial Marketing.*

This new concept is an extension of Trade Mark Service that permits the national advertisers to run creative selling messages in the Yellow Pages aimed at "Ready-to-Buys," which are defined as those persons who have been

UNBREAKABLE
HOT OR COLD CANTEEN

Superior to vacuum type bottles for use on line crew and one man trucks. Particularly good for cold liquids as mouth opening is large for inserting cubes or chunks of ice.

- One gallon capacity—light weight—non-conductor.
- Rugged plastic container will not corrode nor change taste or odor of contents.
- Clear fibre glass insulation.
- Built for rough use.
- Choice of light blue denim or bright red polished cotton covers.

Carton of six canteens,
F.O.B.: San Gabriel.....$39.00

T. A. FORD CO., INC.
P.O. BOX 268
402 AGOSTINO RD. SAN GABRIEL, CALIF.

Here's Safer, Easier Reel Handling

●Here's the reel jack that is strong and stable without hard-to-handle extra weight. An aluminum alloy housing reduces overall weight by 21 pounds, yet maintains full 10-ton capacity. "T" shaped laminated oak base gives solid, safe foundation. Single acting mechanism provides easier operation. Handles reels to 84" dia.; weighs 83 lbs. Furnished with 5' lever bar.

Write for full data on Reel Jack No. A-1029 and other Simplex Utility Jacks.

Pole Pulling and Straightening Jacks—Save time, cut work crews necessary to pull, straighten or move poles. No. A-1538 has aluminum housing, 15-tons capacity, weighs 63 lbs.

All-Purpose Jack — No. 310A lifts, pulls, pushes at any angle. Four lift points. 15-tons capacity.

WORLD'S LARGEST MFRS. OF INDUSTRIAL MECHANICAL AND HYDRAULIC JACKS
SIMPLEX JACKS

TEMPLETON, KENLY & COMPANY
2557 Gardner Road, Broadview, Illinois

placed in a buying situation by a need or desire for products or services.

The ad campaign in support of this new concept is aimed at agency and business executives who influence advertising or marketing decisions.

Mr. Ruppman said that flexibility and convenience are keys to the new service. "It is so flexible it can be tailored to match the distribution method and marketing pattern of any product or service."

Discuss Inter-American Telecommunication Network

Experts and consultants on the Inter-American Telecommunications Network, called together by the Inter-American Economic & Social Council of the Organization of American States, met recently in Mexico City to discuss various aspects of the network.

The Meeting of Experts on the Inter-American Telecommunications Network (abbreviated RIT, from its Spanish language equivalent) stated that:

"The development of telecommunications within the Americas and between the Americas and the rest of the world favors the rapprochement of the various countries, facilitates their relations, coordinates their interests, and aids their economic development.

"The proposed agreement for establishing and coordinating the operation of an inter-American telecommunications network is designed to achieve these objectives.

"A study of the technical and economic possibilities of this proposal shows its implementation to be feasible.

"The International Telecommunications Convention grants the members and associate members of the International Telecommunication Union the right to hold regional conferences, conclude regional agreements, and create regional organizations in order to solve telecommunications problems that can be dealt with on a regional level."

The experts recommended: (1) that the Inter-American Economic and Social Council submit to the Council of the Organization of American States for consideration, an appended draft agreement on the Inter-American Telecommunications Network Organization; and (2) that the Council of the Organization of American States be requested to convoke the First Plenary Assembly of the RIT Organization in mutual agreement with the Preparatory Committee.

The appended draft agreement mentioned included a chapter on establishment of the organization, in which it was stipulated that every self-governing state of the Americas has the right to be a member of the RIT Organization.

The territories or groups of territories within the Americas that do not conduct their own international affairs shall enjoy the right to be represented and to participate in the Organization, the draft agreement also stated.

The draft agreement went on to say: "The immediate purpose of the RIT Organization is to promote the establishment and coordinate the operation of a telecommunications network, of high technical quality, that will include all the states and territories in the Americas and be called 'Inter-American Telecommunications Network.' "

Other recommendations advanced by the Meeting of Experts included ones in the following areas:

Financing for the development of RIT.

Rates.

Transmittal of information on the approximate cost of the network and participation by country.

Communications systems to be used in RIT.

Adoption of the standards of the international consultative committees of the International Telecommunication Union for the design and construction of national telecommunications systems.

Study of traffic and switching problems of RIT.

Military Telegraph Train

The War Department procured the first telegraph train for military use in August 1861. Known as a "flying tele-

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

EVERSTICK ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

MAGNOLIA GLAYZIT
Telephone Refinisher
POLISHES

Cleans, revitalizes, preserves the surface! Dustproof—polish can't come off on cloth when dusting. Only dust comes off! Restores cabinet-maker's finish to furniture! Adds years to life of any finished surface! Supreme for telephones.

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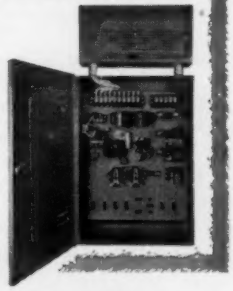
OBSTRUCTION LIGHTING CONTROL and LAMP FAILURE ALARM UNITS ... APPROVED
for unattended TELEPHONE COMPANY MICROWAVE RADIO-RELAY application.



MODEL LC-2102
For two light levels
(Shown with BR-1205 Resistor Ass'y.)

COMPLETE
... WITH BEACON DIMMING AND DUMMY LOAD RESISTORS

SIX MODELS AVAILABLE for 1, 2, and 3 light levels — with choice of test switches or circuit breakers. All units provide a separate signal upon failure of each top lamp, and for failure of any one or all side light lamps on the tower. Choice of switches or circuit breakers in maintenance test circuits . . . circuit breakers provide individual overload protection for each lamp circuit on the tower.

Request Descriptive Bulletin HPS-153

HUGHEY & PHILLIPS, INC.
MANUFACTURERS OF
300MM Beacons, Obstruction Lights, Photo-Electric Controls, Beacon Flashers, Special Junction Boxes, Microwave Tower Light Control and alarm Systems, Tower Isolation Transformers, and Complete Kits for: Tower Lighting, Sleetmelter Power and Control.
3200 N. San Fernando Blvd. Burbank, Calif.

graph train," it consisted of horse-drawn wagons equipped with Beardslee magneto-electric telegraph sets, field wire, flags, rockets, and other equipment—much of it obtained from commercial telegraph companies. Army telegraph trains, using the Beardslee magneto-electric set especially procured by the Signal Corps, were first employed in the Civil War peninsular campaign in the spring of 1862.

Kansas, Nebraska Companies Appoint Managers

Darrel Thomas has been named manager of the Moundridge (Kan.) Telephone Co., succeeding Charles J. Florion who resigned to assume similar duties for the Stanton (Neb.) Telephone Co., it was reported on May 26.

Mr. Thomas has been in the telephone field for six years, the past three in Conway Springs, an exchange of the Sedgwick Telephone Co., Inc., Haviland, Kan.

Ground-Air Communication

By means of an antenna suspended below the basket of an Army Signal Corps free balloon over Washington, radio signals were received aloft from the Navy Yard at Washington and from Annapolis in May 1908. This was the first known military use of radio for ground-air communication.

Budelman Names Empire Teletronics and Space Com

Budelman Electronics Corp., Stamford, Conn., has recently appointed two new distributors for its products—Empire Teletronics of Arvada, Colo., and Space Com, Inc., of Santa Rosa, Cal.

Empire Teletronics will handle Budelman products in Colorado and Utah; Space Com will have charge of distribution in California, Oregon, Washington and Arizona.

Budelman manufactures telephone carrier, voice-frequency telephone repeater, UHF, and microwave point-to-point multiplex radio equipment.

Noller Announces New Data Transmission System

The entry of Noller Associates Inc., Berkeley, Cal., into the field of industrial control and communications was announced on June 1 by W. E. Noller, president.

This new company will place special emphasis upon the design and manufacture of electronic systems for data transmission between two or more points.

Several such systems, each incorporating advanced solid-state techniques, are now in production, the company stated. Included are code transmission and telemeter equipment of the On-Off, frequency-shift and three-state frequency-shift types. An alarm and control system, featuring distributed multi-station operation, is another available system with wide application.

Other products include voice-operated switches for use in telephone repeaters and conference room telephone service.

Mr. Noller is an active member of the I.R.E., and is active in behalf of WESCON, having served four years as a member of the board of directors.

Mr. Noller was most recently associated with the Lynch Carrier Systems, holding the position of director of planning.

Other past business affiliations include Bell Telephone Laboratories and the Pacific Telephone & Telegraph Co.

He is a graduate of the University of California, having received an MS degree there in 1939.

Pearl Harbor

Personnel operating an Army Signal Corps radar set at Opana, Hawaii on Dec. 7, 1941 reported a large flight of unidentified aircraft approaching the Island. Their warning was ignored, and almost an hour later the surprise attack by Japanese aircraft was successful.

LOOK TO THE LEADER . . .

for
• RELIABILITY
• SERVICE
• NATIONALLY KNOWN TELEPHONE SUPPLIES

Prompt delivery of your order as specified is assured by Lindsay's fast, efficient, personalized service. Lindsay specializes in telephone supplies *only* . . . warehousing a complete line of the finest nationally known brands . . . your guarantee of the best as you want it . . . when you want it.

LOOK TO LINDSAY

THE LINDSAY TELEPHONE SUPPLY CO., Est. 1939
360 East Highland Road, Northfield, Ohio • Telephone: IMperial 7-7181

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Of poles, crossarms, and preservative treatments. Analysis of wood preservatives. Consultation and specification writing.
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ROBERT E. FOLEY CONSTRUCTION CORP.
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48 GRISWOLD STREET
BINGHAMTON, N. Y. TEL. 2-7215

TUDOR AND YAGER, INC.
Telephone Construction
TIPTON, INDIANA
Phone OSborne 5-2267

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CABLE PRESSURIZATION
SYSTEMS ENGINEERED AND INSTALLED
UTILITIES CONTRACTING CO.
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Bloomington, Ill. 5-7717 Durham, N.C. 7-1316
Lebanon, Ky. 660 Wausau, Wis. 2-2356
Victorville, Calif. 5-9012
PERFORMANCE Has Built Our Business

Wiremold Names McGovern To Metropolitan N. Y. Sales

Philip F. McGovern has been appointed district sales manager for the Metropolitan New York area by The Wiremold Co., Hartford, Conn. He succeeds George W. Sundstrom who has retired after 38 years of service.

A district sales representative for Wiremold in Jersey City, N. J. and adjoining territories since 1952, Mr. McGovern will continue to cover this area. He will be assisted by Allan C. Bradbury, district sales representative for Long Island, Queens and Westchester; and by Francis F. Mahan, district sales representative for Manhattan and Richmond County.

Before going to Wiremold, Mr. McGovern had been with a New Jersey industrial jobber, and before that, with the General Cable Corp. in Bayonne. A graduate of St. Peter's College School of Business, he served as a gunner with the 20th Air Force during World War II.

Mr. Sundstrom joined Wiremold in July, 1922, after having worked for the Manhattan Electric Supply Co. and the General Electric Inspection Co.

Project Diana

Using a modified SCR-271 long-range radar set, engineers of the Army Signal Corps at Belmar, N. J., on Jan. 10, 1946 succeeded in making radio contact with the moon. This was known as Project Diana.

First Use of Pigeons

Homing pigeons, obtained and trained by the Army Signal Corps, were first used experimentally in July 1878 in the Dakota Territory with limited success. Flights were later attempted between Cuba and Florida during 1888.

C.O. & P.A.B.X.
ENG.—INST.—MODIF.—ROUTINE
NEW OFFICE OR ADDITION
HAVE —— T.E.I. —— DO IT
COMPLETE — GUARANTEED
New and Used C.O. Equip. Furnished on Request
TELEPHONE ELECTRONICS INSTALLATION CORP.
2118 E. 30th St. Erie, Pa. Phone TW 9-5885

"America's Best Cablemen"
A complete cable construction service for telephone companies.
U. S. CABLE CONSTRUCTORS, INC.
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Plant, Traffic and Commercial Engineering
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CLASSIFIED SECTION

Rates 15 cents per word payable in advance. Minimum charge $3.00 for 20 words or less.
Classified advertisements must reach us 8 days before publication date.

WANTED TO BUY

FEDERAL STEP-BY-STEP CENTRAL OFFICE EQUIPMENT. Write Box No. 4410, c/o TELEPHONY.

WANTED ALL MAKES OLD TELEPHONES—our truck will pick up and pay you Cash on the spot. Telephone Co., Turtle Lake, Wis.

TELEPHONES—all types—any condition, candlesticks, wall sets, etc. Write advising quantities available. Our trucks will pick up. Reply to Box No. 3952, c/o TELEPHONY.

FOR SALE

FOUR PRACTICALLY NEW ELECTRONIC SECRETARIES—$325.00 each. Parker Valley Telephone Co., FOB Parker, Arizona.

LEICH 901-wall or desk magneto telephones. Cleaned, tested and guaranteed, $16.50 each. As removed from service, no broken or missing parts, $15.00 each. Turtle Lake Tel. Co., Turtle Lake, Wis.

ONE POSITION KELLOGG JUNIOR MULTIPLE SWITCHBOARD equipped with 100 common battery and 100 universal lines, 10 with reversing jacks 15 universal cord circuits equipped for full selective 10 party automatic ringing complete with motor driven interrupter 1 model S subcycle, 1 standby single frequency pole charger, one 3 ampere 24 volt General Electric Charger, 4 verticals Reliable Electric Main Frame with 320 pair 303H protectors and 480 pair terminal blocks. All for $500.00 as is or $600.00 crated FOB Cornelia, Ga. Standard Telephone Co., Cornelia, Ga.

Limited Quantities of Reconditioned W.E. 354 Wall Telephones, F-1 Handset, with New Coiled Cords, Metropolitan Dial, Straight Line Ringer, 3600 ohm. We can supply in some cycles, if desired. Color Black only. Price with Dial—$12.50. Price, Dial Blank—$10.50.

Request Catalog—Telephones, Switchboards, Parts, Trucks, Wire and Cable.

BOHNSACK EQUIPMENT COMPANY
GERMANTOWN, N. Y.

FOR SALE

YOU HAVE OUR LISTINGS. During June only, an extra discount—10% on Strand, 20% on Hardware and Equipment—from our already rock-bottom prices on orders $200 or more. Empire Steel & Wire Corp., P.O. Box 1054, Erie, Pa.

NORTH McBERTY MCX-500 ALL RELAY SYSTEM—400 private lines equipped with Code Ringing for 8 parties per line. Maximum 3200 Party Lines (100 Lines Additional Capacity).
4 groups, 9 links per group, 9 manual office trunks, 20 pay station lines, 4 P.B.X. Groups, 8 outgoing and 7 incoming trunks with necessary power and signalling equipment for operation.
Two 110 Volt Rectifiers for Charging Battery, operated on 24 Volt DC System.
Condition Excellent—used by Southern Bell Telephone Company. Approx. 10 Years Old. Can be added to other existing equipment. Fully automatic—no personnel needed to operate. Blueprints and test equipment included in Purchase Price.
Ideal for small town where a modern communications system is desired. Also ideal for a community, large company or plantation style town where private company controls its own telephone exchange.
AVAILABLE FOR INSPECTION GREENVILLE, S. C.

GENERAL PURPOSE MACHINERY & EQUIPMENT CO., S.A.
374 BROADWAY NEW YORK 13, N. Y.

Parts for Kellogg #1000.
Cleaned and tested

Sub bases with chrome plungers	1.50 ea.
Handset handles	1.00 "
Induction Coils	1.00 "
Condensers	1.00 "
Ringers (Most frequencies)	1.50 "
Transmitters	.50 "
Handset rings	.15 "
Handset transmitter cups	.25 "
Handset receiver caps	.25 "
Receivers	.50 "
Kellogg dial as removed. Numbers only	1.00 ea.
Numbers and letters	1.25 "
Kellogg 1100 wall and 1000 desk As removed from service. No Broken	7.00 "

Parts for A.E. 40. Cleaned and tested

Cases	2.50 ea.
Handles only	1.00 "
Transmitter and receiver units	.50 "
Caps	.25 "
Complete Handles	2.00 "
S. L. Ringers	.50 "
Condensers Large	.35 "
Condensers Small	.25 "
Rubber Base rings (New)	.20 "
A. E. Dials. As removed Numbers only	1.00 "
Numbers and letters	1.25 "

FREE
Instructions on changing cases in 5 minutes; no soldering.
Telephone Equipment, Inc.
Montrose, Michigan

FOR SALE

IN STOCK

DIA Field Wire: ALL NEW Signal Corps Telephone Wire. 4 Copper, 3 Steel Strands per Conductor. Plastic & tough Nylon Jacketed, TWISTED PAIR. For Drop, Emergency, Etc. On 1 Mile Reels.
PRICE .....$37.50/MILE DELIVERED ! !

NEOPRENE JACKETED TELEPHONE CABLE: 5 Pair, 19 Gauge, Twisted Pairs, Solid Copper Conductors with Laytex Insulation. Color-Coded, Neoprene Jacketed. 1,000 Foot Reels with some longer lengths also available . . . all continuous.
PRICE.....$39.50/M FT. DELIVERED ! !

★ ★ ★

SPECIAL

#19-2, (BD-0219) REA Approved under PE-24 Spec. DIRECT BURIAL Wire with Steel Tape Serve in Lengths of 1,000 Ft. to 1,200 Ft. Each—ALL NEW & Guaranteed
@ $28.65/M Feet DELIVERED ! !

51 Pair, 19 Gauge DIRECT BURIAL CABLE, Plastic Jacketed as per REA Spec.—Red/Clear Conductors. ALL NEW! IN STOCK—2325, 1435, 1340, 1283, 1145, 1120, 1020 Plus many other lengths of 800 and 900 Ft. or smaller.
SPECIAL PRICE..$360.00/M FT. DELIVERED !

RURAL Distribution & Plastic Jacketed Cables, Neoprene Drop Wires. All Makes of Telephones and Hardware also IN STOCK!

TELE-WIRE SUPPLY CO., INC.
178-10 Liberty Ave. Jamaica 33, N. Y.
CALL AXtel 7-4756 COLLECT!

EXPANDET
SCREW ANCHORS
Vinyl Plastic • Best Device of Its Kind Available • Use with All Materials.
DANISH IMPORT
21566 Donaldson-Dearborn, Mich.

YOUR DIALS
Reconditioned by Specialists
Exclusive Materials and Techniques Applied to All Makes and Types
DIAL HAVEN INC.
P. O. BOX 655, MONROE, N. Y.
Code 914 STory 3-2221

GET RESULTS
SALES — ATTENDANCE — RECOGNITION
Use Quality Telephone Incentive Jewelry
WRITE
O. C. TANNER CO.
1930 So. State St. • Salt Lake City 15, Utah

FROM "BUCKEYE" STOCK

XY SWITCHES

124	each	Stromberg-Carlson #S-30157-1 Regular Connectors on plug-in plates	(NEW)
38	each	Stromberg-Carlson #S-30158-1 Trunk hunting Connectors on plug-in-plates	(NEW)

RINGERS

500	each	Stromberg-Carlson #61-A Ringers, Straight Line biased 1800 ohms	(NEW)

TRANSMITTERS

300	each	Stromberg-Carlson #210279 (#29) Transmitter Capsules	(NEW)

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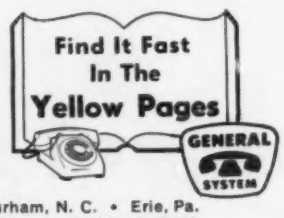

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